THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXV. No. 1928.] LONDON, APRIL 24, 1900. [52ND YEAR. PRICE 6d.

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THE ORIGINAL
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Sent out in Dry Powder with Oils for mixing separate.
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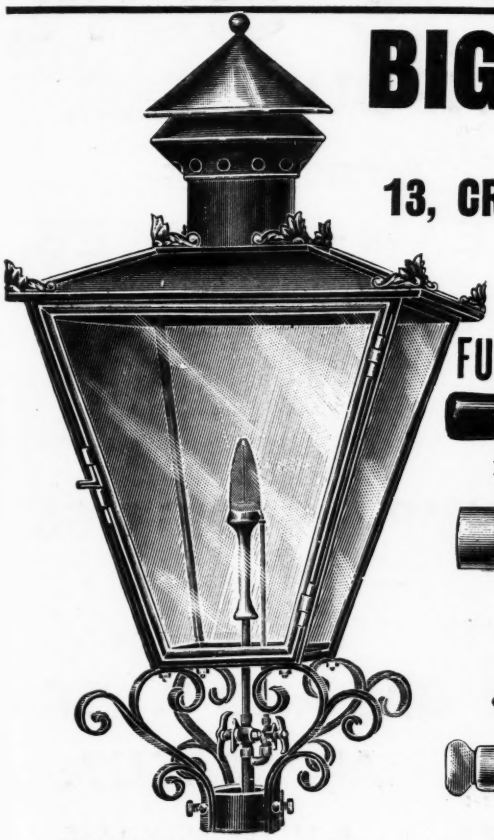
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SEVERAL DESIGNS SHOWN BELOW.

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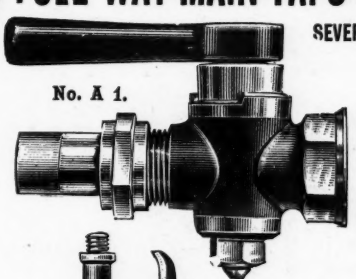

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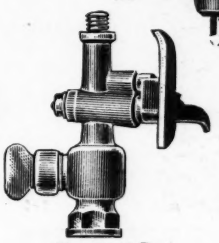
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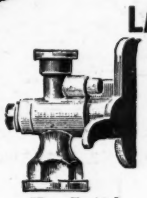
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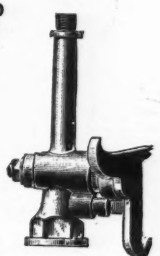
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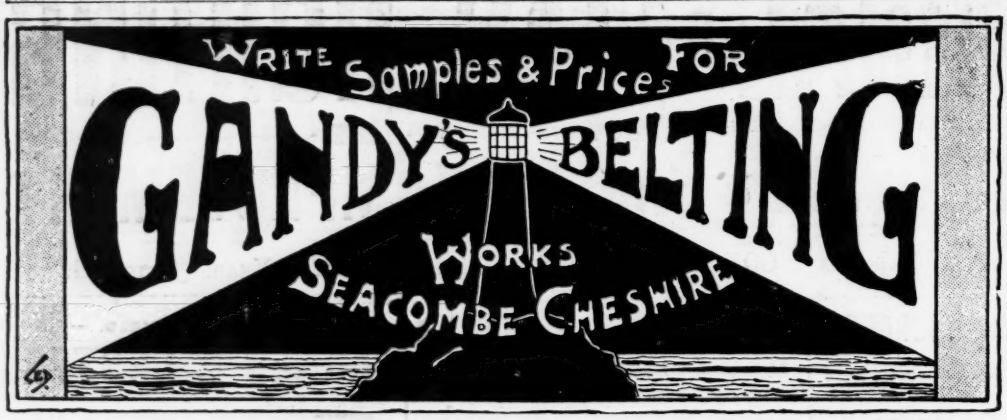
*Specially constructed for New Incandescent Burner.



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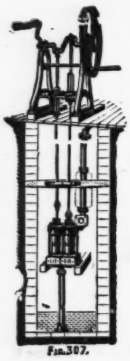

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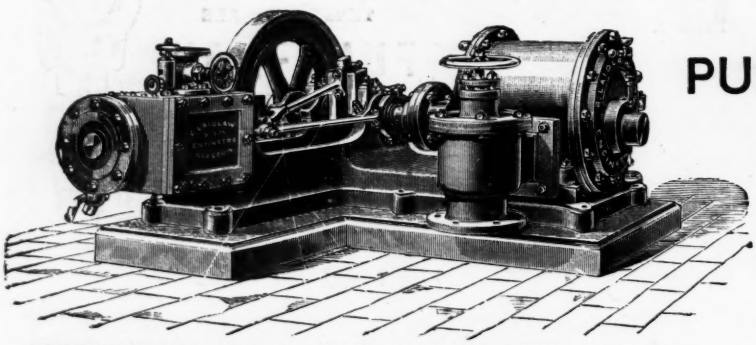

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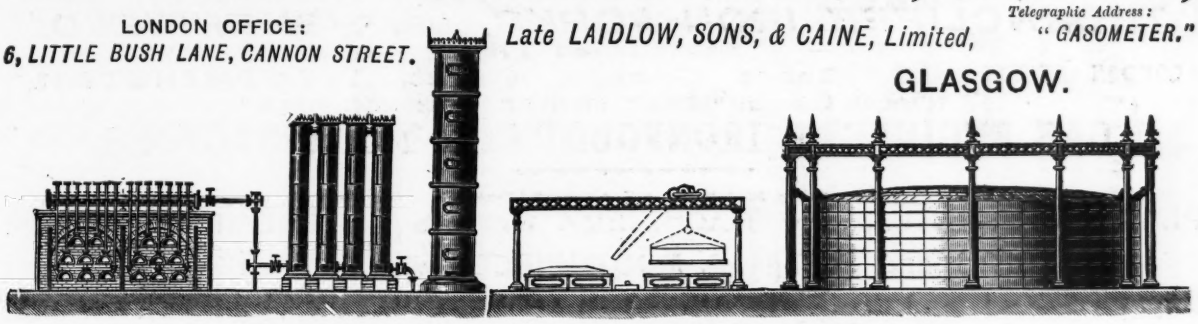

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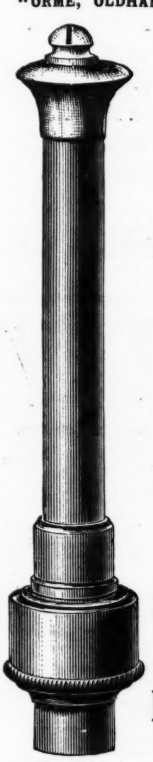

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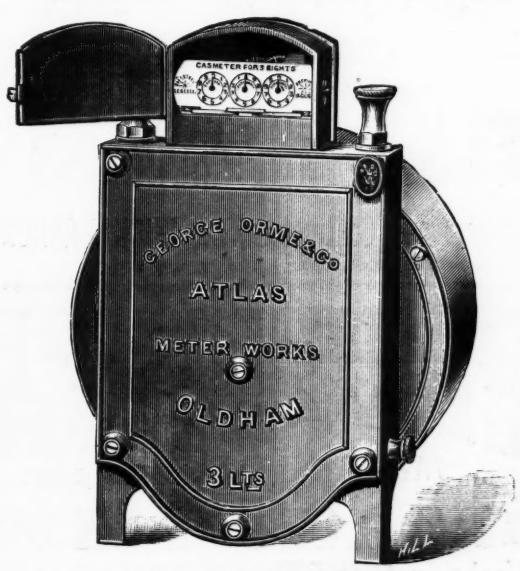

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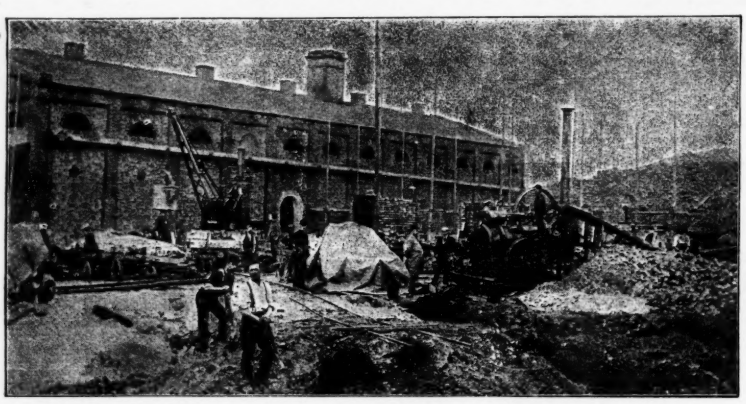

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Gas Retorts (SEGMENTAL, HORIZONTAL, or INCLINED.)

Special Bricks & Blocks for GENERATOR & REGENERATOR FURNACES.

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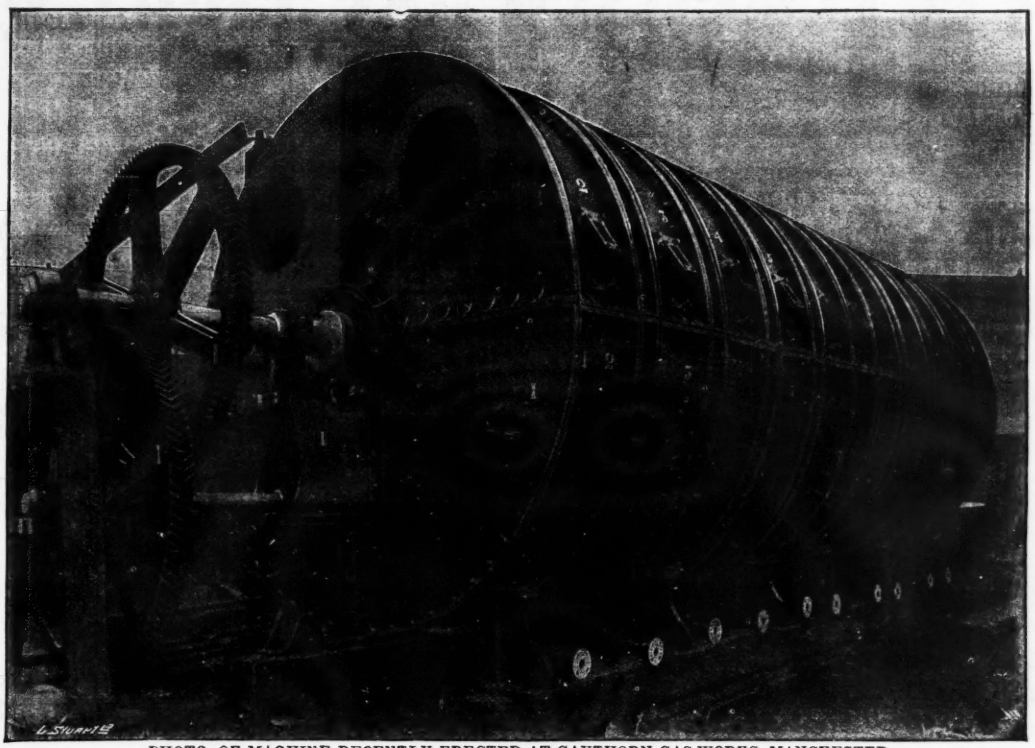

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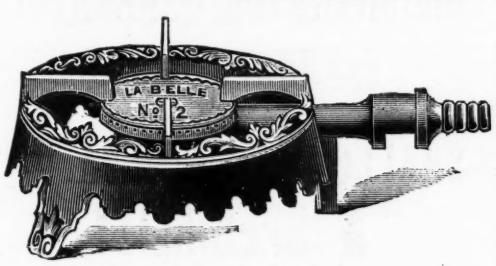
MAXIMUM HEAT with a SMALL CONSUMPTION OF GAS.



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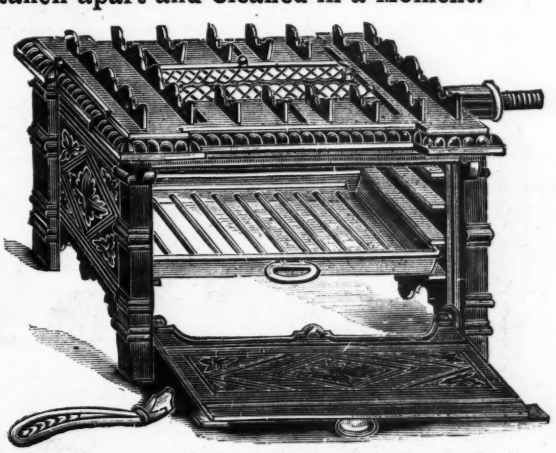

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THE INTENSIFIED GAS-LIGHT CO.

LIMITED,

Hereby give Notice, that they have the right, under a License, to use Welsbach Mantles in conjunction with the Intensified Burners—high and low pressures—and Purchasers of these Burners can obtain Mantles for use therewith from the Local Agents of the Welsbach Company.

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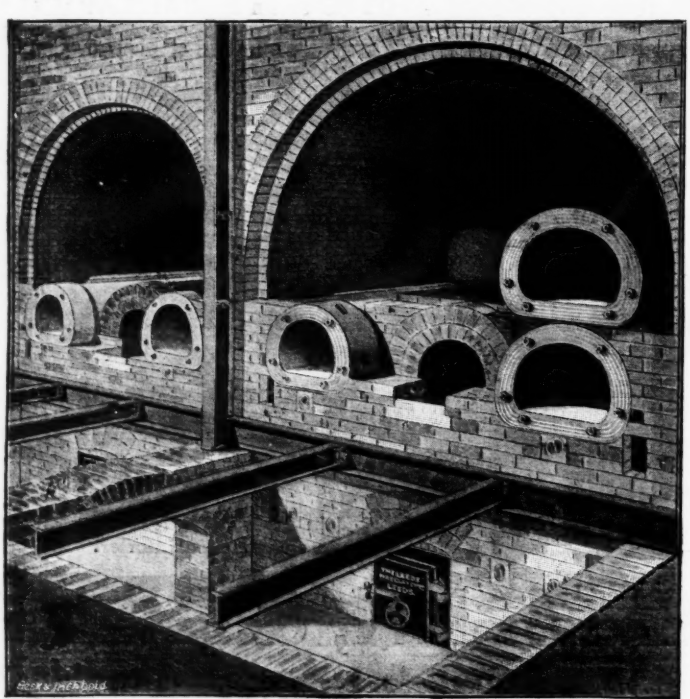

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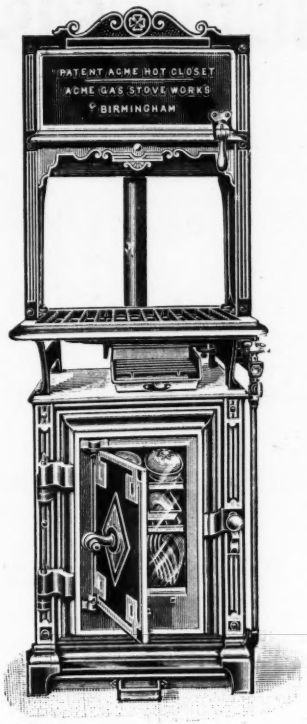

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HOT CLOSET & GLASS DOOR,

Has been a long-felt want in all Households, and costs nothing extra to Heat as all the Waste Heat from the Oven is utilized.

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LARGEST MANUFACTURERS IN THE UNITED KINGDOM OF GAS-RETORTS,

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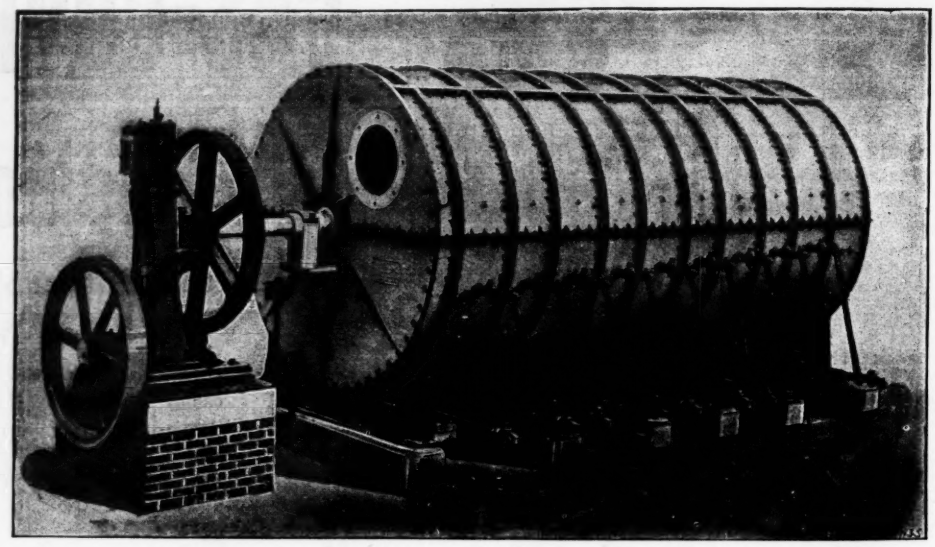
Maximum Strength Liquor produced, Minimum Water Supply and Driving Power required.



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Nearly 600 in use.

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ANGLO-AMERICAN OIL COMPANY, LIMITED.

This well-known quality of Oil is used at most of the Corporation Works and Companies' Works throughout the United Kingdom. Contracts have also been entered into with several of the large Railway Companies.

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Stock of about 30,000 Tons is usually carried by us at our Installations at Avonmouth, Birkenhead, Barrow, Manchester, and London.

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Copenhagen (Second)	2,500,000	Edinburgh	2,000,000	Utrecht	1,000,000
Belfast	1,700,000	Guildford	350,000	Deventer	150,000
Belfast (Second)	4,500,000	Brentford	1,200,000	Portsmouth	1,000,000
Brussels	700,000	Syracuse, N.Y.	850,000	Bournemouth	1,000,000
Brussels (Second)	700,000	Bridlington	125,000	Aylesbury	150,000
Liverpool	3,500,000	Middlesbrough	1,250,000	Hamburg	1,750,000
Liverpool (Second)	4,500,000	Croydon	1,250,000	Redhill	275,000
Tottenham	750,000	L. & N.W. Ry., Crewe	700,000	Dublin	2,000,000
Tottenham (Second)	750,000	Taunton	225,000	Posen	450,000
Santiago de Cuba	400,000	Lawrence, Mass.	400,000	Dunedin (N.Z.)	150,000
Swansea	750,000	Commercial Gas Co.	850,000	Lincoln	500,000
Manchester	3,000,000	Commercial (Second)	850,000	Antwerp	1,500,000
Brighton	1,750,000	Commercial (Third)	1,250,000	Brussels	1,000,000
Preston	1,500,000	Rotterdam	850,000	Brighton (Second)	1,850,000
New York	1,200,000	Dorking	125,000	Stockport (Second)	500,000
Southport	750,000	McKeesport, Pa.	500,000	Croydon (Second)	625,000
Bath	1,000,000	G.L.&C.Co., Bromley	3,750,000	Maidenhead (Second)	225,000
Newburg, N.Y.	350,000	G.L.&C.Co., Nine Elms	2,750,000	G.L.&C.Co., Beckton	2,250,000
Newburg (Second)	250,000	Durham	200,000	G.L.&C.Co., Fulham	1,750,000
Hoylake	125,000	New York	4,000,000	Tottenham (Third)	350,000
Coventry	600,000	Scarborough	800,000	Sydney (Harbour)	500,000
Coventry (Second)	600,000	Perth, W.A.	125,000	Sydney (Mortlake)	500,000
Bordentown, N.J.	125,000	Bremen	550,000	Manchester (Second)	3,500,000
Winchester	200,000	Maidenhead	225,000	Hull	1,500,000
Shanghai	225,000	Epsom	225,000	Longton	600,000
Stockport	500,000	North Middlesex	150,000	Staines	600,000
Norwich	1,000,000	Wandsworth	1,800,000	Commercial (Fourth)	2,000,000
Holyoke, Mass.	600,000	Aarhus	800,000	Dublin (Second)	2,000,000
St. Joseph, Mo.	750,000	Falmouth	150,000	Faversham	200,000
Lea Bridge	350,000	Southampton	800,000	Birmingham (Swan V'ge)	1,500,000
Lea Bridge (Second)	350,000				

The 1891 Installations of The Gaslight and Coke Co., 12,000,000 Cubic Feet Daily.

Total Capacity above 112,700,000 Cubic Feet Daily.

United States Total 231,800,000 Cubic Feet Daily.

Grand Total - 344,500,000 Cubic Feet Daily.

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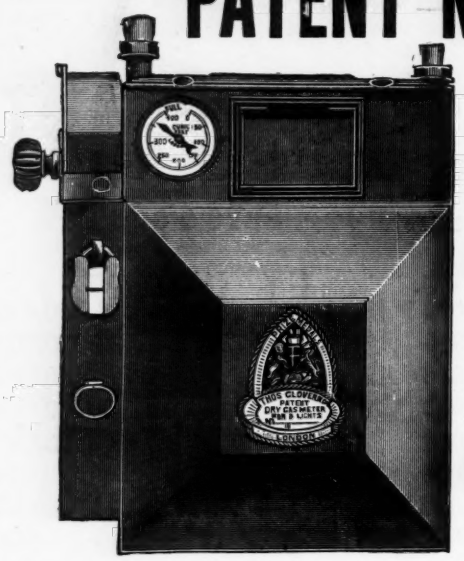

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EDITORIAL NOTES.

The Scheme of the New Technical Institution.

THE Joint Committee appointed by the Councils of the Gas Institute and the Institution of Gas Engineers for the purpose of considering the question of the amalgamation of the two Societies, have succeeded in evolving a draft set of rules which they consider might be made the basis of a fusion of the respective organizations into one new, united, and comprehensive technical Institution. Copies of this document are actually in the hands of members; and the scheme will come up for discussion first, in order of time, at the forthcoming meeting of the Institution of Gas Engineers, which will open on Tuesday next. In the circular to members which accompanies the draft rules, Mr. Thomas Cole, the Secretary of the Institution, remarks that "it has been suggested that a suitable "name for the proposed new Association would be 'The "'Institution of Gas Engineers and Managers;'" but he adds that "this point will be open for discussion, together "with other details connected with the scheme, at the "annual general meeting." It will occur to most readers of this communication that something more than "details" will have to be settled on this occasion. In the first place, the question of principle has not been formally dealt with. The programme of the general meeting, to which we gave publicity last week, provides for the raising of a discussion on the general subject immediately after the delivery of the President's Address. This is obviously all that can legally be done at this time, because there has been no regular reference of the matter to a Committee of the Institution. The Council have acted so far entirely on their own responsibility, for which reason their Committee have not formally reported upon their proceedings. The whole thing has been a spontaneous movement, of which the two Councils took cognizance, and which, approving, they merely directed their representatives to put on a practical footing in the shape of a draft of rules. Heartily supporting the general idea as we do, we judge it expedient to offer to all and sundry this explanation of how the matter stands, in order that there may be no cavilling on the point of form. Of course, those members of both Societies who have been instrumental in furthering the mutual attraction of the two bodies, floating on the ocean of public opinion, appreciate the situation; but there are others who have heard little or nothing about it.

Very properly, therefore, having regard to the nature of their commission, the Joint Committee have addressed themselves exclusively to the details of the proposed united organization; and a very creditable Memorandum of Association they have produced. Apart altogether from the drafting of "clauses," which is chiefly a matter of form, the curiosity of interested persons will be concentrated upon the suggestions for dealing with the crucial points upon which the scheme as a whole must be judged. With regard to the name, it may not be amiss to recall the historical discussion of this very question on the occasion of the revision of the constitution of the British Association of Gas Managers at Birmingham, in 1881. It had been proposed to call the new Society "The Gas "Institution," to which objection was reasonably taken. Those who wish to help the Councils in settling this knotty question should carefully read the reported debate, in the light of what other Technical Societies have done since. It is incontestable that all modern offshoots of the original type—the Institution of Civil Engineers—have repeated the first name for the organization, while introducing the specific classification before the generic title. There is no valid objection to the modified title now suggested, unless it be that it hints at a division of members which is nearly obsolete. Far be it from us, however, to dogmatize on such a matter. The question is of great importance—this naming of Technical Societies being emphatically outside the scope of Juliet's time-worn query.

The serious difficulty of the so-called "traders" finds recognition in the forefront of the Memorandum, which, in defining the "objects" of the Institution, refers to a disqualifying clause intended to exclude from membership persons "who shall be actively engaged in or about the "management or business, either as principal, managing "director of a joint-stock company, or as agent, or traveller, "of any trading company, firm, or concern doing business

"with gas undertakings, whether as vendor or as pur-"chaser." Subject to this clause, the Institution is to consist of "persons who are, or have been, engaged in the "conduct of gas undertakings, or who have been regularly "educated as gas engineers." There are some more exact definitions of eligibility; but this is the general idea. It is fair to suppose that the drafters of these clauses carefully and fully considered their meaning and probable bearings, both generally and with reference to A and B cases. There is nothing antecedently objectionable in any of these suggestions.

Lastly, a very distinct trend of public opinion has been followed by the admission of a section authorizing the Council, at discretion, upon receipt of a request from a "sufficient" number of members, associate members, or associates resident in any district, to create a Local Section of the Institution in such district, with power to dissolve such Section at any time afterwards. Each Local Section is to be constituted, and its affairs carried on, in accordance with the rules and regulations laid down from time to time by the Council. All this is very good. It is to be hoped that those into whose hands these recommendations come will consider them all in good temper, and with a single mind to help forward the best interests of the gas industry. In the meantime, it is only right to recognize the good-will, tact, skill, and self-sacrifice of all those who have set their hands and given their time to this preliminary work, inspired, doubtless, by the same spirit to which we gave utterance in these columns on Sept. 5—in the aspiration that, for the gas industry at any rate, the Century might end in Peace and Unity. Let the world clearly see that British Gas Engineers can stand together in one Fellowship, and lend one another a hand when common action is needed. It is the old way, and the only way, of justifying the human instinct for association of the like-minded.

The Problem of the Export Coal Trade.

By a coincidence not uncommon in the every-day work of technical journalism, an "Editorial Note" in last week's issue of the "Journal" mooted once more the question of the advisability of putting an export duty on British coal, and in another part of the same issue there appeared an article recalling an answer given to the question by a Select Committee of the House of Commons in the year 1873. It has possibly occurred to some of our readers who noticed this circumstance, that one article replied in a sense to the other, especially as the Committee addressed themselves particularly to the point of the expediency of taxing exported coal. Other readers, however, may have seen in the revival of the question an example of the familiar observation that the unanswerable conclusions of the political economy of one generation do not satisfy the inquirers of the next generation. The last two paragraphs of the article on "The Scarcity of Coal in the Seventies" are well worth reading. They give the substance, and the phraseology, of an economic conclusion which, for "cocksureness" of matter and pomposity of style, bring back the Cobdenite era in all its glory. There is a hardness and coldness about the diction of the report which reminds the older reader of the historical fact that the Chairman of this very Committee (Mr. Ayrton) afterwards wrecked a Gladstonian Ministry through sheer personal unpopularity. He was a just man, and one learned in all the wisdom of the Egyptians—that is, of the Manchester School of Economists—but desperately arrogant and overbearing. He is gone now; and the style of disposing of economical puzzles which he favoured is likewise dead. The younger generation has witnessed the making of breach after breach in the impregnable rampart of pure commercialism raised by the Cobdenites with logic, cemented by enlightened selfishness; and the old questions which were so summarily laid by these prophets are marching in again, as formidable as ever.

By another coincidence, "Engineering" last week had a leading article in the same sense as our own "Editorial "Note." Our contemporary acknowledged the full force of the objection of scientific economists to any arrest of the national exports, on the ground that it is by these that we pay for imports. Of course, we do not contend for a moment that Mr. Ayrton's political economy was at fault, or that true economical doctrine is for one particular period only. Indeed, we do not offer any judgment on the matter at all; but merely put the question as something which is upon men's minds just now. And it is certain they will not take a reply of 1873 as conclusive. The besetting weakness of economists is their propensity to bind every particular question to the Procrustean bed of their general deductions. Thus, when "Engineering" says that "if our exports of fuel fall off to the extent of "a million sterling per annum our imports must decrease "correspondingly," one is driven to ask, Why? It is pure economic doctrine, no doubt; but is it certain that it is necessary to export coal in order to pay for foreign wheat, and cotton, and wine? Is the coal ear-marked? Could not its value be made up by something else?

The plain man may be pardoned for at least asking whether the qualities and nature of all exports are to be ignored in considering the money value of the total bulk of trade. Of course, if this is so, and British coal is only to be regarded as a commodity, like cotton cloth, then to restrict its exportation or consumption in any way would be wrong. Naturally, the coalowners and others in the coal trade would protest against any restraint being imposed on their commercial operations—let trade be free! This argument would have been esteemed conclusive in 1873. Nowadays, if we mistake not, the general opinion is that the British coal capital belongs to the nation, and not exclusively to the coalowners and miners. Some of this coal possesses peculiar properties, as the country learns during every colliers' strike. Some of it is unequalled for steam raising; other descriptions are best for gas manufacture. The question is, Are we warranted in selling these unique natural products off the premises, so to speak, for the money of those whom we should be quite justified in telling to fend for themselves by other means? It is not as if we can ever restore what is thus sent away. Interference with trade—with any particular trade—is a very serious thing to contemplate; but the exhaustion of the best and most-run-upon British coal is a more serious eventuality still. The export coal trade is not now more than 19 per cent. of the output; and this is some consideration. Perhaps the best result that could follow from a rediscussion of the general problem would be the creation of a stimulus to the more economical use of coal of all kinds, and especially to the avoidance of waste.

Incandescent Gas Lighting and Coal Prices at the Eastern Counties Association Meeting.

The public portion of the work of the presidential year of the Eastern Counties Gas Managers' Association was completed at Cambridge last Wednesday; and Mr. Harry Wimhurst (whose services to the Association the members never tire in acknowledging) leaves the chair with the knowledge that both meetings in his year of office have furnished a large amount of readable matter. As at the first, so at the second, the subjects presented for consideration were of that class which possess something more than superficial interest for every gas manager. At last Wednesday's meeting, the discussions were on street incandescent gas lighting and the coal question. On the first topic, one had concluded that the last necessary word had been said. Gas engineers proved long ago the unequalled efficiency and cheapness of the system for public purposes; and, with the growth of resistless evidence, the views of local authorities and the public have veered round in a gratifying manner. But with the progress of the system, there is, not in all cases but in some (we have noticed it ourselves with regret), a disposition on the part of those having the control of incandescent gas-lamps to shirk attention to points of detail which should be constantly observed in order to maintain and further the success which has been achieved. Mr. J. H. Sheldrake has therefore done good service in giving to the gas industry, in the paper which he read last Wednesday, certain prescriptions (drawn from his long experience as a specialist in public lighting) for obtaining the best and most effective illumination possible in our public places and ways. Constant regard to the advice which he tenders will have the double effect of promoting satisfaction on the part of the public and conducing to the happiness of the gas manager. With most of what Mr. Sheldrake had to say the members were in full agreement; but one or two could not refrain from having a side-shot at the Company with whom he is connected. To Mr. Sheldrake personally, considering his position, this was perhaps hardly fair. Opportunity, however, is said to be a fine thing; and the remarks that were made will no doubt meet the eyes of those for whom they were intended. Mr. Jolliffe's criticism respecting the price of mantles should

be read in conjunction with a reference to the same matter in the article which appeared last week on incandescent gas lighting in South London.

The second subject discussed was that which is engrossing the attention of all gas-works administrators at the present time—the price of gas coal. It was opened by Mr. R. G. Shadbolt, who has on more than one occasion proved his ability to infuse into a subject, without a set composition, the necessary spirit to awaken that interest which is requisite to produce a good debate. His opening disclosed a finished study of the question from the gas manager's point of view; and with most of his deductions from the facts he advanced, few of his colleagues will be disposed to disagree. The fundamental causes which have combined to bring about the present condition of the coal market are shown to be increased exports and the improved home trade. But Mr. Shadbolt, without mincing matters, charges the coalowners with having taken an unfair advantage of their position as masters of the situation to the extent, in the case of gas coal, of from 4s. to 6s. per ton. Three colliery representatives joined in the discussion; but they did not attempt to justify to the full the rise which has taken place of from 5s. to 7s. per ton. Our "Correspondence" columns, however, are open to them, if, on further consideration of Mr. Shadbolt's figures, they care to undertake the task. Taking into his calculations the improved value of residuals, Mr. Shadbolt concludes that increases in the price of gas of from 4d. to 6d. per 1000 cubic feet will be sufficient to enable gas-works proprietors to uphold their position of twelve months ago; and the advances which have already been announced show this is the general feeling. On the whole, Mr. Shadbolt takes an exceptionally cheery view of the situation. He thinks that outside factors will soon come into operation which will tend to bring down coal prices nearer to their former level; and he cherishes the belief that other sources of light, heat, and power will be hit harder than gas, and that the gas industry will benefit thereby. We can only hope that Mr. Shadbolt's accounts and those of other gas undertakings will prove the truth of his prediction; but we certainly have our misgivings.

The general business which received attention included the election of the officers for the ensuing year. Mr. J. G. Hawkins, of Spalding, will be the worthy occupant of the presidential chair; and Mr. Richard Brown, of Cambridge (whom it is a pleasure to welcome into the higher spheres of Association work), succeeds him in the office of Vice-President.

The Necessity for Economy in Capital Expenditure.

Some months ago we took occasion to point out the necessity for gas undertakings restricting as far as possible the work of extending or reconstructing works and plant during a period of high prices, high wages, and dear money. If there were force in the contention then—and its truth was, we think, as indisputable as it was undisputed—how much more forcible is it now! For in the interim, owing to the abnormal state of the coal market and the general activity of trade, prices of all building and construction materials have risen considerably above the already high rates current at the beginning of the winter. The prices of iron, steel, copper, lead, tin, and zinc (the last two in particular) have been steadily on the increase. Owing to the advance in coke, lime, chalk, and cement are all much dearer than they were last year; while wages in the building trades are very high. The Board of Trade report the granting of increases during March to 7174 workpeople employed in these trades, averaging about 3s. per week; London plasterers obtaining a rise of 1d. an hour, making their wages as much as 44s. 10½d. per week, exclusive of overtime. The result of this condition of the markets is that extension of business or plant in any direction is, for Gas Companies, an unduly expensive matter. In so far as the extension of business is concerned—the laying of mains and services, the provision of meters and stoves, and, in the case of prepayment customers, of fittings—the higher expenditure per million cubic feet of business secured is inevitable. So far as the extension of manufacturing plant to take up this business is concerned, it is obvious that it should be kept within the very closest limits of safety. Otherwise, of course, all the consumption thus provided for becomes permanently burdened with a high charge for capital, tending to stereotype a higher price for the gas.

There is, moreover, now a further reason for a niggardly, rather than a lavish, expenditure of capital, and that is the inevitably lower prices of gas stocks which must follow upon the increased charges for gas. Thereby the rate of interest on the realized, as distinguished from the nominal, value of newly-issued stock is correspondingly raised. To illustrate the point, let us assume that, in normal times, an addition to existing plant can be made, equal to providing for an increase in output of a million cubic feet, at the cost of £350; and that such capital could be obtained by means of 3 per cent. debentures at par. The annual charge for interest on capital for the million cubic feet of business would be £10 10s., or 2·64d. per 1000 cubic feet. Now it will not be overstating the case if we say that, at present prices for material and labour, the work that could have been done, and the plant that could have been bought, under normal conditions, for £350, would not cost less than £500. Nor shall we exaggerate the probable effect of the rise in the price of gas during the next twelve months upon the market value of gas stocks, if we assume that this £500 could not be raised next year by 3 per cent. debentures at a price above 96 per cent. On this basis, the annual charge for interest on capital for the million cubic feet of business would be £15 12s. 6d., or 3·75d. per 1000 cubic feet. That is to say, an extension of plant at the present time would (assuming that the capital so spent would have to be replaced by fresh capital obtained from the public within, say, twelve or eighteen months) saddle the output so provided for with an abnormal charge of over 1d. per 1000 cubic feet.

We do not say that such extensions can actually, in every case, be postponed or avoided, for the dearness of coal has notoriously stimulated the consumption of gas. Where they are inevitable, the undertakings must pay the cost; but a very clear case can be shown for exercising the utmost vigilance over all capital expenditure at the present time and in the near future.

The Progress of Progressivism.

Progressivism is getting on. Its more enthusiastic upholders in the newspapers are already playing fast and loose with the profit-making element in municipal trading. Sometimes they clamour for the municipalization of an undertaking because it is profitable; and then they will cry for municipal enterprise to supply something which cannot otherwise be provided, because it does not pay. Last Saturday, the "Daily News" indignantly asked why the old-established service of river steamers on the Thames should be given up, merely because the boats did not pay. The London County Council must step in and supply the need. It only requires to be pleaded that river steamboats are a necessary of life to the working man, and the County Council will doubtless take some measures to provide them. Unfortunately, our daily contemporary advances, as one reason for a Thames steamboat service, the truth that the river channel commands unrivalled prospects; many miles of its banks being perhaps the finest river front in the world. This kind of consideration, however, does not specially appeal to those to whose requests the London County Council lend a gracious hearing. Indeed, if the Council had been allowed their way, Westminster Bridge and the Victoria Embankment would long ago have been spoilt by tramcars supposed to be needed by the working man for getting to and from Lambeth and the City. On the other hand, London will scarcely seem the same without the familiar old steamboats, which gave visitors such ample pennyworths of picturesque river voyaging. But the river had long ceased to be a real passenger route. This use was killed by the parallel railway; and it is idle to lament what is superseded.

Another plea for municipal action untrammelled by the obligation to consider profits, is advanced on behalf of the Workmen's Housing Council. It having been ascertained by experience that the clearing and rebuilding of "insanitary areas" is not a paying business for Local Authorities, the cry is boldly raised for rehousing the evicted people by aid of the rates. In extenuation of this demand, it is argued that, since overcrowding or houselessness drives some people into insanity or crime, it is more economical to help pay the rents of the sane and passably law-abiding. What effect the adoption of this policy by Local Authorities would be likely to have on the independent building trades, is not considered. Still less thought, if possible, is spared for the consideration that the people who are evicted in the cause of improved housing are usually not the same as

those who are afterwards accommodated with comparatively luxurious dwellings at less than their cost. But this does not matter a jot to your true Progressive. So long as he Progresses somehow, he does not care how or whither. As a rule, others pay the fare. The Workmen's Housing Council thoughtfully suggest that if their demands cannot be met by the aid of loans at 2 per cent., repayable in a hundred years, Local Authorities should be empowered to expend profits made on their other undertakings for the promotion of housing schemes. Thus the sins of some Improvement Committees are being visited upon them in the fulness of the time. Why should not everybody have his rent paid by his parish?

The Affairs of the Paris Gas Company.

In another column we give, as usual, an abstract translation and summary of the accounts of the Paris Gas Company for the past year's working. The gas consumption in the Company's district again shows a highly gratifying increase, for which various reasons are given. The growth in the demand for gas during the daytime is very remarkable; and the same may be said of the fast-growing popularity of the incandescent system of gas lighting, which has already turned the tables on the ordinary burners, including those of the regenerative type. Everything in the report goes to show that the Administration are "cultivating their garden," as the French classic has it, with well-rewarded assiduity. Still, it is startling to learn that it was necessary to lay out £185,816 on capital account to meet the demands of the Company's customers. Few would be prepared for such a testimony to the growing popularity of gas in Paris. There has been the usual litigation between the Company and the Municipality, referable to the desire of the latter body to both eat their cake and have it. An interesting part of the report details the nature and extent of the assistance lent by the Company to the Exhibition authorities; and it is only another proof of the kindly way in which this truly great Company treat their employees, that the Directors have voluntarily decided to give all their humbler officers and workpeople a substantial bonus towards meeting the higher expense of living in Paris consequent upon the Exhibition. A very guarded passage at the end of the report mentions the negotiations actually in progress with respect to the settlement that must be arrived at before the expiration of the present concession.

Another Outrage on London Streets.

Commenting last week on the ugliness of London, in connection with which Mr. Whiteing is reported to have said that the "frightful lamp-posts" have much to answer for, we could not know that another protest against the latest outrage of the kind on the amenities of the capital was awaiting publicity in "The Times." Some months ago we noticed the infatuated decision of the moribund St. Martin's Vestry to spoil the region round Charing Cross with central electric arc lamps, which, as we have repeatedly pointed out, is the very worst possible position for street lights in a busy thoroughfare. For several weeks past, the work of fixing the lamp-posts has been in progress; and hideous things they looked in their sickly-coloured coat of foundry paint. Now the heads are being put on; and an "Assoc.R.I.B.A." writes to "The Times" complaining bitterly of the "atrociously debased and vulgar character" of the whole fitment. Who are the persons responsible for inflicting this "grievous artistic humiliation" upon long-suffering London? No Continental people would believe that the power to decide what lamp-posts should be set up in the very centre of the Empire rests with an obscure handful of vestrymen. Perhaps it is the parish beadle. Unhappily, Londoners have the shocking example of Waterloo Bridge to remind them that the London County Council are no more to be trusted in this matter than a parochial official. Talk about the ugliness of London being due to the climate! The climate, with its ever-changing atmospheric effects, is the one redeeming feature of the province by the Thames. It is the hopelessly mean, ignorant, and heedless Public Authorities, both big and little, who make London so much more vulgar-looking than it need be. Such utter lack of distinction in all that goes to the making and equipment of those streets which ought to bear witness to the existence of a sense of dignity on the part of the authorities, could only result from a general lack of a feeling for art on the part of the people. The Royal Academy in Piccadilly, and the ghastly lamp-posts in Whitehall—which testifies the more strongly to the barbarity of British taste? It now remains for somebody to ask a question in Parliament about it to exhibit to the world the astounding fact that the nation pays millions to open up a vista befitting Westminster, only to have the approaches spoilt by the pretty fancy of a small Vestry in street lamp-posts. Truly, we are a practical people, and not like Frenchmen and Germans, who are so foolish as to believe that the matter of street decoration is fit for the solicitude of a Ministry!

WATER AND SANITARY AFFAIRS.

The rejection of the Purchase Bill of the London County Council, followed by the withdrawal of their Welsh Supply Bill, and the adoption of a similar course, in deference to the Speaker's ruling, by the promoters of the Metropolitan Water Companies Bill, indicated pretty clearly that there would not be any general legislation this session upon the London Water Question. The definite terms in which the Royal Commission reported against the County Council as the authority to control the water supply, and in favour of the constitution of a Water Board, threw upon the Government the responsibility of taking the initiative in the direction indicated by the Commission. That they would do so this session, with their hands as full as they are of colonial complications, was generally thought to be out of the question. The immediate necessities of the Metropolis had been provided for by the intercommunication scheme; and consequently London could well afford to wait a little while for the carrying out of the larger project of the purchase and transfer of the water undertakings. The disposal of the Bills above alluded to, however, has not damped entirely the ardour of certain parties who are desirous of reforming the existing arrangements under which the Water Companies are working. Pending legislation on broad lines, it is considered that some attempt should be made to carry out the recommendations of the Royal Commission on the subject of control. These will be too fresh in the recollection of our readers to need recapitulation.

The Commissioners thought their proposals would be equally applicable and desirable whether the water undertakings were purchased or not; but they did not suggest that they should be carried out apart from any general legislation on the water question. Yet a feeling exists that this should be done; and expression is given to it in a leading article in the current number of the "Lancet." Our medical contemporary lays special emphasis upon the recommendations of the Commissioners in regard to conferring more power upon the Water Examiner, who, as well as all the officials appointed to supervise the London Water Supply, should, it is suggested, be paid entirely out of Government funds. He should also have the right, as the Commissioners pointed out, to enter the works at any time, and be in a position to obtain all his information independently of the Engineers and officials of the Water Companies. The "Lancet" thinks that if a Bill were introduced by the President of the Local Government Board to carry out these and other changes in regard to control recommended by the Commissioners, it would be "supported from both sides of the House." We fail to discover the immediate necessity for testing the feeling of the House on these matters. The Water Examiner, as the Commissioners themselves acknowledged, has never had any impediment thrown in his way in the discharge of his duties, nor is he likely to have. At the same time, it would undoubtedly be preferable that, as an important public official, what he now does by courtesy he should be able to do by right; and the Water Companies are not afraid of that right being conferred upon him. But the existing arrangements in this regard do not seem to us to call for special legislation. London would suffer no harm by their being left to be dealt with as part of the whole question.

With the advent of summer weather, the thoughts of the water engineer turn to his reservoirs; experience of the past two seasons rendering him nervously anxious as to their condition. We have just been having a brief spell of unusually warm weather, but are not yet beginning to get alarmed in London, for we have at our doors the faithful Thames, whose volume, though much less last month than it was in February, is still ample. The quantity of water which flowed over Teddington Weir on the 1st ult. was close upon 6000 million gallons—enough to serve London

for 29 days; and though the volume gradually fell under the influence of the drying winds, the flow at the end of the month was equal to seven days' supply, after the Water Companies had drawn their statutory quantities. March was a dry month, the rainfall at Oxford being only 0·5 inch, distributed over about seven days. The average fall being 1·5 inches, there was a deficit of 1 inch of rain for the month, which reduces the excess for the present year to 1·61 inches. While there is no reason just now for expecting a repetition of the troubles arising from the drought of the past two summers, there is quite as much need as ever for the prohibition of the wasteful use of water, and the exercise of care in even its legitimate employment. This fact has been borne in upon the consciences of several Local Authorities in the Provinces, who have already taken steps to prevent their stores of water from being recklessly drawn upon. As will be seen by a paragraph which appears elsewhere, the Water Committee of the Birmingham Corporation have issued a very significant notice to the consumers on the subject of the use of water for gardens; at Bolton, we believe, a house-to-house inspection of consumers' fittings is going on, in consequence of recent large leakage; while the Ashton Joint Water-Works Committee are again taking steps to put a stop to the great waste resulting from "swilling" flags and other indiscriminate uses of water, though they have to confess that they have exhausted every means of warning people against their carelessness in this regard. Thousands of gallons of water are wasted every day in the way alluded to. The Committee have good reason for their action, for even now their reservoirs contain nearly 87½ million gallons less than they did this time last year. In this matter of flag-swilling, it appears that Oldham, Manchester, and Stockport are much in the same condition as Ashton. They have very little water to spare for other than its strictly legitimate uses—viz., domestic and industrial purposes; and they will have to carefully husband their resources. It is therefore advisable to endeavour to enlist the co-operation of the consumers in their efforts to attain this object.

Iron and Steel Institute.—At the forthcoming annual meeting of this Institute, to be held at the Institution of Civil Engineers on the 9th and 10th prox., one of the papers expected to be read and discussed will be "On the Manufacture and Application of Water Gas," by Carl Dellwik, of Stockholm; and another "On Driving Blowing-Engines by Crude Blast-Furnace Gas," by Adolphe Greiner, of Seraing, Belgium.

The Gas Supply from the Everett Coke-Oven Plant.—According to the last report of the Massachusetts Board of Gas and Electric Light Commissioners, the New England Gas and Coke Company began to supply gas from their works in Everett through the Massachusetts Pipe-Line Gas Company to the Jamaica Plain Gaslight Company on the 3rd of December last, and to the Brookline Gaslight Company on the 5th. The manufacturing plant of the Jamaica Plain Company was closed down on the date named, and since then all the gas sold by this Company has been made at the Everett works, and purchased from the Pipe-Line Company. The quantity supplied in this way during December averaged about 365,000 cubic feet per day. Some 1,231,700 cubic feet per day were supplied from the same source, and in a similar manner, to the Brookline Company in that month. This was mixed with the illuminating water gas made at the Brookline works, and distributed in the territory of that Company as a mixed coal and water gas, containing about 54 per cent. of the latter.

North of England Gas Managers' Association.—The 46th half-yearly meeting of the Association will be held at the Gas Offices, Newcastle-upon-Tyne, next Saturday, under the presidency of Mr. W. Doig Gibb, Engineer of the Newcastle and Gateshead Gas Company. According to the circular issued by the Hon. Secretary (Mr. J. H. Penney), the business will open with the presentation of the accounts and the election of officers for the ensuing year and of candidates proposed for membership. Mr. E. H. Millard, of Durham, will then give a *résumé* of his paper on "All Sorts and Conditions of Governors," read at the meeting of the Association held in October last. As the author dealt on that occasion principally with the summer consumption of gas, he will add supplementary remarks, with diagrams, on winter consumption. It may be remembered that at that meeting the President gave notice of his intention to propose a change of rules, to allow of the admission to the Association of pupils and persons holding responsible positions in gas undertakings. The suggestion has, however, been withdrawn until such time as the Committee can present a more matured proposal on the subject. At the close of the business, the members will dine together; and an interesting feature of the subsequent proceedings will be the presentation by the President of the illuminated Jubilee Addresses to Mr. J. H. Cox, of Sunderland, and Mr. Charles Sellers, of York, decided upon in October.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1074.)

THE Easter Holiday has not done the Stock Exchange any good. So far from the markets reopening cheerfully, and the public coming in with alacrity to buy, the week has been very dull indeed. Business was extremely meagre, and the general tendency all round was flat. Prices of almost every description, from Consols and the War Loan downward, have undergone a shrinkage. Not even the fine weather could impart a cheerful tone, as it often does. The condition of the Money Market was to some extent responsible, rates ruling pretty stiff, although towards the close there was a tendency to relax the hardness. In the Gas Market, the drift was naturally downwards; the burden laid on all gas companies by the enormous increase in the price of coal becoming generally understood. But still the reductions in the value of quotations throughout the list are moderate and quite reasonable. There were no signs of any alarm on the part of stockholders, or any disposition to part hastily with their holdings. Transactions were only moderate; and we do not believe that much stock actually changed hands. In the Metropolitan area, Gaslight ordinary opened at 102¾, and afterwards touched 103½, but fell away to 101¼ on the closing day; the quotation showing the loss of a point. The secured issues, the return upon which will not be affected by any rise in the price of gas which is likely to happen, were unchanged; but their prices were only moderate. South Metropolitan had a considerable fall for it. But even now it stands very high, although the closing mark was 132½. The debenture also fell a point. Commercials were quiet, and unchanged. There were very few transactions in the Suburban and Provincial group. Brightons appeared steady; but Brentfords and Crystal Palace had to give way. The Continental Companies were in better case, for none of them had to suffer loss in quotation, though prices marked were only moderate. Among the remoter undertakings, Cape Town and River Plate underwent a reduction; but Ottoman furnished the sole instance of a rise in price. Business in Water showed a marked increase in the number of transactions; but they were at lower figures. Realizations were the rule, and the quotations of almost all the Companies showed a reduction.

The daily operations were: Upon the reopening on Tuesday, things were quiet in Gas; and prices were mostly only poor. Buenos Ayres and River Plate fell ¼. There was a slight increase in activity on Wednesday, but not much variation. Cape Town fell ½. Thursday's transactions were very limited; but many changes took place. Brentford old fell 5, ditto new 2, South Metropolitan 1½, Gaslight ordinary 1, and Crystal Palace 2; but Ottoman rose ¼. In Water, Chelsea and Lambeth receded 2 each, and East London 1. Business on Friday was much the same. South Metropolitan fell 1½, and ditto debenture 1; but Buenos Ayres recovered ¼. Saturday was almost as active as any day in the week. Gas prices did not vary. But in Water, Grand Junction, West Middlesex, and both Lambeths relapsed 1 each.

ELECTRIC LIGHTING MEMORANDA.

No Profits this year for Manchester—Wise Candour—St. Pancras Playing with Insolvency.

IT is reported that the Electricity Committee of the Manchester Corporation have met to consider the estimates of revenue and expenditure of the department for the ensuing year. The result of their deliberations has not been officially communicated to the papers; but "it is understood the Committee do not anticipate being in a position to hand over anything out of the profits to the relief of the rates at the end of the year." Last year the amount so handed over was £10,000. "It is supposed that the cost of repairing street explosions which have occurred, and of expenditure in relaying the mains, are in part responsible for the altered state of things." The diction of this explanation is not faultless; and it is especially difficult to understand how a street explosion is "repaired." It is easy to comprehend, however, that such things have to be paid for. The Manchester Corporation Committee are to be commended for their straightforwardness in resolving to clear off their extraordinary working expenses out of revenue as they go along. Their experience is also to be recommended to the careful consideration of such ardent municipalizers as Dr. Little, of Marylebone, and of everybody else who cherishes the delusion that municipal electric lighting is a reliable source of disposable profits. The Manchester Corporation electricity supply undertaking is so big a business that it has attained political significance; and its existence has been advanced as a sufficient reason for the exclusion of all other undertakings of the kind from the region which it more or less effectively occupies. What would be said of the administration of such a concern by a company, if the next year after distributing £10,000 in dividends to the proprietors, the dividend had to be passed because of a street explosion or two and a breakdown of mains?

The least that would be said in the circumstances would be that the Directors ought to have been more provident, and have

refrained from indulging in the luxury of paying any dividend until they were humanly certain that all ordinary trading risks and contingencies had been duly taken into their calculations of net profit. But the Manchester Electricity Committee succumbed to the weakness of all municipal traders. They went on living from hand to mouth, just in the usual way; and now there are no "profits" available for distribution in connection with this very important municipal undertaking. It is to be hoped, both for the sake of the "principle" of which so much is heard in Parliament and elsewhere, and also for the helpless ratepayers, that once having decided to do the right and wise thing by getting out of their Fool's Paradise, the Manchester Electricity Committee will not turn back until they have put their affairs in proper order. One is sick of hearing so much chatter about the "principle" of municipal trading at a profit or otherwise; and meanwhile all the touting electrical engineers of the day are ranging the country "advising" Local Authorities everywhere to go in for electric lighting, assuring their victims that the venture will be a paying one from the start. Manchester ought to be above encouraging this delusion by consenting to the evil practice of declaring profits out of capital.

While on this subject, we must not overlook the splendid example of the St. Pancras Vestry, whose electric lighting business has just been largely advertised in "municipal"-minded journals as having had "a successful year." Let us see in what this vaunted success consists. The principal figures relating to the working of the undertaking for the past year were given in our "Electric Lighting Notes" last week; and we now write with the official statement of the accounts before us. The capital outlay to the close of the year amounted to £288,146, and is still growing. How much of the year's addition of nearly £50,000 was real extension capital, is questionable; but inasmuch as the net amount charged to works repairs and maintenance in the revenue account is only £2610, and on distributing plant only £2000, it may be reasonably concluded that the outlay was not all for enlargements of earning capacity. On this capital of £288,146, the business shows a return of £44,880, of which about £38,000 is outside custom. The Vestry charge the ratepayers £6639 for public lighting, which is very helpful to the show. It cost, on revenue account, £27,230 to keep the concern going, although all charges are cut down to the minimum. Rates and taxes, for example, figure for only £1015; and there are no administration expenses. On the face of the revenue account, however, there is a credit balance of £17,649. Out of this has first to be provided interest £7433, and redemption £3374, or a total capital charge of £10,807—say, 3¾ per cent. on the capital. Cheap enough! These payments leave a net balance of £6841, or a noble trade profit of 2·3 per cent. But there are several little things to be squared out of this handsome sum. Like Manchester, St. Pancras has knowledge of street explosions to be "repaired." One would look in vain for an insurance fund. What about depreciation? That is entirely within the discretion of the Committee; and they virtuously set aside £1600 under this head—for accumulators and meters, and such like, only. Then they vote £4000 to the reserve fund, which stood at £8000; and—reckoning a carry-forward of £1892—the Committee are able to repay £2000 to the lighting rate, and carry forward a balance of £1134 "to the accounts of the current year." And this is what municipal financing calls "satisfactory results"! The Chairman of the Committee (Dr. Walter Smith) is reported to have stated, in moving the adoption of the accounts, that during the nine years the electric supply of the parish had been in the hands of the Vestry, they had made a net profit on the undertaking of £34,980. Of course, this statement gets repeated by all the municipalizers and electrical touts, and helps the fleecing and deluding of other unfortunate ratepayers at the hands of their legal guardians, who, honest men and well intentioned as they are, do not understand the meaning of the word "profit" in connection with this class of business. We will ask Dr. Walter Smith to put it to any competent and impartial auditor—a professional accountant—whether the St. Pancras Vestry have yet succeeded, after nine years, in making both ends meet in the case of their electric lighting undertaking, even with the subsidy for public lighting at perhaps thrice the cost of gas. Without this subsidy, where would the undertaking be? With it, is the undertaking paying its way, with an alleged gross profit balance of 6 per cent. on the ninth year's revenue account, and absolutely nothing hitherto written off the book value of perishable property and machinery standing at upwards of a quarter of a million of money? Let Dr. Walter Smith inquire of a namesake (Professor R. H. Smith) what he thinks of the position.

Professor Lewes's Lectures on "The Incandescent Gas-Mantle."—It has been already notified in the "JOURNAL" that Professor Vivian B. Lewes, F.I.C., F.C.S., is to deliver a course of three Cantor Lectures on the above subject at the Society of Arts; commencing on the 7th prox. In the first, he will deal with the history of incandescent gas lighting; reviewing the discoveries which led to the production of the mantles of the present day, indicating the oxides suitable for making mantles, and the method of preparing them, and pointing out the services rendered by thoria and ceria. The second lecture will be devoted to an explanation of the process of manufacturing mantles, and its influence upon their life. In the concluding lecture, Professor Lewes will describe the burners employed.

DR. J. S. HALDANE ON CARBURETTED WATER GAS.

THE current (April) number of "Public Health," the recognized journal of the Incorporated Society of Medical Officers of Health, contains a full report of an important paper just read before the Society by Dr. J. S. Haldane, F.R.S., a London Gas Referee, on "The Risks attending the Use of Carburetted Water Gas for Domestic Lighting Purposes." The paper is not altogether suitable for reproduction *in extenso* in our columns, containing as it does a good deal of introductory and explanatory matter, and much that appeared in the report of the Home Office Departmental Committee. We propose to skim it here in order to place readers in possession of the eminent author's latest views on the subject, referring to the original source those who desire more.

Dr. Haldane begins by briefly describing the nature and the methods of manufacturing coal and carburetted water gas. As to the latter product, which he assumes to be made by the ordinary producer-*cum*-carburetter and superheater type of plant, he admits that "it has very much the same smell as ordinary coal gas, and consumers would not know the difference." He states the composition of the purified gas as "about 35 per cent. of hydrogen, 30 per cent. of carbonic oxide, 20 per cent. of marsh gas, 10 per cent. of ethylene, &c., and a little nitrogen." He observes that in this country there does not appear to be much difference as regards cost between coal gas and carburetted water gas—the difference which exists depending largely upon local conditions; but he explains that there are other advantages on the side of the latter which render it a desirable accessory to coal-gas works. As regards the toxic qualities of illuminating gas of both kinds, Dr. Haldane cites Dr. J. Lorrain Smith, of Belfast, as having established it beyond doubt that the poisonous effects of both coal gas and carburetted water gas are due to the carbonic oxide alone. The other constituents are perfectly harmless in comparison.

The next step is to show how carbonic oxide acts on the animal economy, and how this action is detected and measured. This introduces the author's own diluted-blood test, which is described and qualified as surpassing all other known tests for carbonic acid in blood in delicacy, accuracy, and simplicity. It is stated that as little as 0·2 per cent., or even less, of carbonic oxide in air, is sometimes fatal to animals; but usually 0·4 per cent. is required to cause death unless the exposure be very prolonged. "There is every reason to believe that the same holds good for men." Less than 0·05 per cent. of carbonic oxide in the air breathed seems to be incapable of forming a dangerous compound with hœmoglobin, on account of the excess of oxygen overpowering it, so that the maximum of saturation does not exceed 35 per cent. With more than about 0·2 per cent. of carbonic oxide in the air, the maximum exceeds 60 per cent. saturation, "and life then begins to be endangered"—apparently in about 1½ to 2 hours. In recovery from carbonic oxide poisoning, the oxide is simply driven out from the hœmoglobin by the oxygen of the air, and escapes in the breath. It is not oxidized in the body. "An hour's breathing of fresh air will suffice in man to remove any dangerous excess of carbonic oxide from the blood; and after three hours the blood is nearly free, although the damage done to the brain, heart, and other tissues during their partial deprivation of oxygen may cause persistent symptoms and often death." Dr. Haldane describes his method of applying the diluted-blood test to determine quantitatively small percentages of carbonic oxide in air, and also to testing coal and carburetted water gas for this constituent. He exhibited the apparatus he employs for this purpose.

Next comes the question of the risks connected with carburetted water gas. First, the risks of the manufacture, which are dismissed as *nil*. This variety of gas making is found to be in practice a "safe and healthy" trade. As regards the risks to the public who use carburetted water gas, the case is declared to be "very different." Dr. Parsons's summary and Mr. A. C. Humphrey's statistics, as given with the Committee's report, are cited, together with Mr. W. T. Allen's table of the mortality returns for Boston (Mass.) since June, 1888. We get also Dr. Haldane's own celebrated exercise in comparative statistics, made for the Committee, displaying what might be expected to happen if London were supplied with gas like that of New York, Boston, and other American towns. "These statistics," says the author, "bring out two points, one being that coal gas is an extraordinarily safe illuminant, so far as risks of poisoning are concerned; the other, that the loss of life from poisoning is fully a hundred times as great with undiluted carburetted water gas as with coal gas. Of the deaths so caused, *only about half are accidental*, the rest being chiefly suicidal, although a few are homicidal."

We pause here to inqure whether the figures relating to other than accidental deaths ought not to have been disregarded in the computation of the risk to life from the use of carburetted water gas as being one-hundredfold that attending the use of coal gas. Dr. Haldane, however, quickly puts the case upon safer ground by remarking that "the risk of poisoning in the American towns supplied with carburetted water gas is certainly very appreciable." The estimation of the degree of risk is another matter. Dr. Haldane proceeds to inquire how the risk occurs. Gas escaping from "one burner" was responsible for 81 per cent. of the accidental, and 55 per cent. of the suicidal deaths reported by the Massachusetts Board since 1889. The ratio

of pure accidents fell to 9 per cent. referred to "gas-stove, or connecting tubing," to 5 per cent. for broken main or service pipe, and to 3 per cent. for "faulty pipe in house." Thus, four-fifths of the accidents and most of the suicides were due to escapes from single burners. This, of course, means bed-room lights; and hereupon the author launches out upon an interesting investigation of what is likely to happen when a gas-jet is accidentally left turned on in a room.

It is easy to ascertain how much gas is discharged by an unlighted gas burner; but the question of how this discharge affects the atmosphere of a closed apartment raises difficult problems of ventilation. From the task of grappling with these difficulties Dr. Haldane did not shrink; and his observations on the results of his experiments are of wide interest. As might have been expected, he found that the rate of inflow of air into rooms varies with the amount of wind outside, the difference of temperature between outside and inside, and other conditions. With a good breeze, the rate of inflow was about doubled. An open fireplace, with no fire burning, about doubled the rate of inflow in a room of 1400 cubic feet; while a fire burning increased the ventilation ten times. With a difference of temperature of 18° Fahr. between inside and outside, the ventilation was increased three times by opening the lower sash of the window 4 inches. With increasing size of room, the rate of natural inflow (other things being equal) increased in proportion to the increased surface of the walls, floor, and roof, and not in proportion to the size of the room. This result Dr. Haldane rightly regards as of special interest, as showing that the value of "cubic space per person" in a large room with only natural ventilation is quite different from that in a small room. For example, in a small bedroom of 500 cubic feet capacity, with all openings closed, the natural ventilation through walls, &c., would amount to 280 cubic feet per hour, whereas in a large room of 30,000 cubic feet it would be only 70 cubic feet per hour for each 500 cubic feet of content. Thus, in large rooms or halls, which, when crowded, often only afford about 200 cubic feet per person, special means of ventilation become almost a necessity. "It is in large, and not in small, rooms that one finds air which contains a large excess of carbonic acid. In the worst class of one-roomed dwellings, with an average of 1400 cubic feet per room and 212 cubic feet per person, Carnelley and I found an average of only 6·6 volumes per 10,000 in excess of outside air, although the samples were all taken in the middle of the night. In churches and other badly-ventilated buildings, one commonly finds from five to ten times this excess."

All this is uncommonly valuable addition to the available data for the rational study of ventilation. Whatever the immediate purpose that instigated Dr. Haldane to make these extensive experiments—he mentions having made nearly 200 air analyses—the thanks of the public are due to him for the useful determinations of what natural ventilation really is and does; for it is by natural ventilation that the vast majority of indwellers must obtain the air they breathe. This by the way.

Taking the most unfavourable conditions for the operation of natural ventilation—doors, windows, and fireplace closed, no wind, and only a few degrees of difference between inside and outside temperatures—a volume of air equal to the content of the room will enter an apartment of 500 cubic feet capacity in 1·8 hours; one of 750 cubic feet capacity in 2·1 hours; one of 1000 cubic feet capacity in 2·3 hours; one of 2000 cubic feet in 2·9 hours; 3000 cubic feet in 3·3 hours; and 4000 cubic feet in 3·6 hours. The first of these rooms represents about the smallest apartment that would usually be regarded as fit for a single bedroom, measuring about 8 ft. by 7 ft. 6 in. by 8 ft. 4 in. high. The largest is a noble apartment 17 ft. by 19 ft., and about 12 feet high. It is instructive to learn that a house with stone walls gave very much the same result as one with much thinner brick walls, so that there is not much choice between houses of different materials of construction. Yet Dr. Haldane admits that there must be exceptional cases, and instances the cabin of a ship as being of necessity almost air-tight except in so far as ventilation is specially provided for. It occurs to one on reading this remark that the treatment of the walls and flooring of rooms may also affect the result; and it would be interesting to learn the effects of distempering, papering, painting, and solid floors, upon the natural ventilation.

Finally, allowing the facts of ventilation to be as Dr. Haldane states them, what is the behaviour of escaped gas from an unlighted burner? It depends on the circumstances and conditions; and this consideration alone is worth recording as a gain. Will escaped gas rise without suffering much admixture with air; will it diffuse in the air? It all depends. When the escape is of large amount, as from unsealing a water-slide pendant, it is the person sleeping in the room above who suffers. When the escape is from an unlit burner it would appear that nothing particular can ordinarily happen, as after a time the gas goes away as fast as it comes. Dr. Haldane "never succeeded in producing an explosive atmosphere in any part of a room by an escape from a burner, although when the burner was taken off, the air near the roof soon became explosive." As regards risk of poisoning, however, which is a different thing from danger of explosion, Dr. Haldane finds that an increase of the percentage of carbonic oxide in the gas aggravates this risk to an enormous—indeed, an "anomalous"—degree. He ventures to put it at "the cube of the relative increase in the percentage of carbonic oxide."

Now, this is a very dreadful conclusion to put forward. A geometrical rate of increase of something, in the proportion of the cube of another factor, is a steadying consideration for any man who has it in his power to alter the second term and has reason to fear the first. This being so, it occurs to one who regards the proposition without prejudice that such a geometrical progression needs very firm support from indisputable facts. Practical persons, especially engineers, habitually look with suspicion on all such neatly-rounded theoretical expressions. It is so easy to say glibly that something increases or diminishes as the cube, or the square, or the nth power of something else; but does it? In order to establish such a conclusion beyond dispute, two conditions are essential—first, that the numerical basis of the computation shall be adequate for the mathematical superstructure; secondly, that there shall be no exceptions that do not prove the rule. In this connection, these essentials are lacking. Dr. Haldane cites one case—that of "the notorious one of the Garston district on the outskirts of Liverpool, where the Liverpool Gas Company distributed it [carburetted water gas] without warning of any kind for about a year, with the result that the proportion of fatal and non-fatal poisoning cases in the district was about the same as in Boston." The fatal cases numbered two. Hardly sufficient to establish a series, not to speak of a geometrical progression! Dr. Haldane flatters Surgeon-Lieut.-Col. Cayzer, of that ilk, with having made a "most effective" protest against this practice, which "quickly led to a discontinuance of the supply at Garston." Still, "it moves," as Galileo said of the earth.

Generally speaking, Dr. Haldane thinks that where carburetted water gas is sold mixed with coal gas, there is a "most distinct increase" in the number of gas poisoning cases. Nevertheless, he is fair to admit that the total number of cases is very small; and he confesses that there have been no fatalities from this cause in Tottenham, where a 50 per cent. mixture has been distributed for years. He seems disposed to leave out Tottenham as an irrational quantity; but trustworthy vital statistics are not to be compiled upon this principle. If two fatalities at Garston prove an average, why should not the immunity of Tottenham, of Stepney, of Brentford, of Norwich, or of twenty other places where they use carburetted water gas without knowing it, possess equal statistical value on the other side? To do him justice, Dr. Haldane seems to have come to a perception that there is something more to be said on the whole subject than the Departmental Committee recognized. Possibly he perceives that Tottenham is not singular. He loyally adheres to the report of the Committee, fixing 12 per cent. as the permissible maximum of carbonic oxide; but he also admits that the limit should be an elastic one, and declares that "any cast-iron legislation on the subject seems distinctly undesirable," which is as much as to say that Dr. Haldane has learnt wisdom during the last two years. For if legislation should be locally or centrally "elastic," the antecedent objection to any such legislation at all increases in force, to quote Dr. Haldane himself, as "the cube of the number" of possible exceptions. This being so, it is not worth talking about. Medical officers of health are good servants of the community; but there are other and much more pressing questions of sanitation for them to grapple with than this very problematical risk of carburetted water gas poisoning.

THE COAL PROBLEM.

On page 1071 of to-day's issue, will be found practically the whole of a very interesting article by "A Correspondent," which appeared in "The Times" last Thursday, entitled "The Coal Famine and the Public." The article contains evidence throughout of being from the pen of an expert on the question of coal supply and consumption (if we had to hazard a guess at the authorship, we should be inclined to name Professor Edward Hull); and we therefore feel some satisfaction in saying that, except in regard to fuller detail concerning some points, those of our readers who have followed the subject closely in our columns will not find much that is new to them, either in facts or in conclusions. The article forms, however, such an admirable survey of the present situation from an independent point of view—we must, in the nature of things, look thereon from the standpoint of the buyer whose whole economics depend upon the price of coal—and of the causes from which it has arisen and continues, that we have no hesitation in drawing particular attention to it.

The writer, referring to the present situation, says truly that, although a coal famine, in the absolute and unqualified sense of the term, is unlikely, and, perhaps, impossible, we are relatively coming near to the stage of famine when coal is so scarce that those who require large supplies have much difficulty in procuring them; when the widely-ramified branches of national industry suffer consequent loss and inconvenience; and when the cost of fuel is such as to compel the ordinary citizen to be parsimonious in its use. That such a state of affairs does exist, is only too well known by the heads of the gas industry. Rarely, indeed, if ever, have the gas-works of this country found themselves—as not a few, and those not the least considerable of them, now are—entering upon practically high summer with their coal-stores swept clean; and living from day

to day on the supplies they are able to wheedle from their contractors, or buy at fancy prices in the market. In five months' time, the winter will be at hand. How, in this five months, and at what cost, are the empty coal-stores to be filled? This is the problem (as serious as any that the majority of reigning gas magnates have ever had to face) that is all important, and immediately pressing for solution, at the present moment.

At a meeting of German merchants recently held, one of the speakers, a merchant of high standing, said that the question for the near future was not at what price coal was to be bought, but how it was to be obtained; and so far as can be understood, this is the difficulty in which large would-be buyers find themselves. Colliery owners not merely ask 60 or 80 per cent. more than they were willing to take a year ago, but only offer much smaller quantities; intimating that they are not eager sellers even of those, as it all depends on the extent to which they can increase their output whether or not they are already over-sold!

As to how this both curious and serious state of affairs has arisen, "The Times" correspondent names five principal causes, all of which have been during the past few months repeatedly explained in these columns as being the sources of the scarcity—namely, the increase in the make of iron and steel; the increased requirements of the world's railways, and the larger volume of traffic on those previously existing; the growth of the world's mercantile marine; the almost unequalled prosperity of all manufacturing industries; and the more general diffusion of wealth, leading to a larger consumption of coal for domestic and other purposes. The writer mentions subsequently, but does not give sufficient prominence to, another source of increased coal consumption. This is the enormous growth of the world's navies in the past ten or fifteen years, which have been—in their construction—the source of much of the activity in the iron and steel trades; which will, for their repair and renewal, render much of that activity of a permanent order; and which, moreover, require for their motive power enormous quantities of coal.

Of the five main causes of scarcity enumerated in "The Times" article, the majority will be seen to be more or less of a permanent character. In addition thereto, another, of a purely temporary nature, must not be forgotten, although, somewhat curiously, "The Times" correspondent makes no mention of it. This is the labour troubles on the Continent, more particularly in France, Germany, and Austria. Those troubles are gradually subsiding, and the coal output will now increase; but there are such large arrears of trade standing over in those countries, that coal will be in heavy demand there for some time to come.

The question of prime importance for the coming months is, therefore, how soon the output of the mines will be brought up to the level of the demand. We said last week that we should require very strong proof to induce us to believe that the coal-owners are not doing their utmost to take advantage of the present demand. In this opinion, we are fully confirmed by the statement of the writer of the article before us. He says: "From the various projects . . . . that have come to my knowledge—including not only the opening out of new collieries, but the re-opening of old ones, and the sinkings made to other seams in existing pits—I am of opinion that within the last fifteen months or so provision has been made for adding quite 20 million tons a year to the coal output of the United Kingdom; and, if the same average annual output per employee as that of the period 1894-97 be assumed, the increased resources of production will probably be considerably more." It may be remarked that, as the average output per employee for the years 1894-97 was some 20 tons less than in 1899, this last observation is scarcely accurate. Taking, however, the writer's figure of 20 millions as being the additional output provided for since the beginning of last year, what does this mean for the future? The output in 1899 was higher than in 1898 by 18 million tons. Of this, over 11 millions were due to better working by the men. About 7 millions in all were therefore due to extended operations. Assuming that the remaining 13 millions additional output is placed on the market this year, there should be a total output for 1900 of 233 millions. As we have already hazarded the opinion that the quantity of coal required to be raised this year, in order to supply the home and foreign markets, and to make up and maintain stocks at something like normal figures, will not fall far short of 235 million tons, we do not think that, unless some sudden, and for the present unforeseeable, break occurs in the iron market—hard markets have a knack of breaking up suddenly, through some big operator's nerve giving way—the supply of coal will overtake the demand, and prices collapse, for some months to come. As "The Times" writer says: "No one knows what the coalminers may do, and . . . in these matters the attitude of labour—which is generally the dark horse—counts for much." Happily, the indications at present are not unpromising; but the summer is a favourite time to "play," and wages are unusually good.

It must, however, be borne in mind that a continued maintenance of present prices must tend towards a reduction in the demand; for no one will buy coal or iron at ruling rates unless positively obliged to do so. It is certain that the coal owners are over-straining their advantage by exacting the last shilling per ton that those consumers who must buy will pay; whereas a more moderate treatment of the market would prolong the present period of trade activity. The owners may easily kill the golden goose. With the foreshadowed increase of output, the present relative scarcity would then solve itself into an absolute glut. But, as we have said, we do not think that will be for some months yet.

"The Times" correspondent finally adduces, as a ground for a Government inquiry, the fact to which we have more than once pointed as calling for such investigation, that "some of our most important fields are rapidly nearing a period of permanently dearer cost of working." It is of the utmost importance that it should be known, as the result of expert inquiry, how soon and to what extent the cost of production, apart from the labour charge, will become permanently higher. It is to be hoped that the necessity for such inquiry will be urged on the Government at an early date.

CONCERNING FOGS.

THE opinion that gas is decidedly superior to electric light in regard to its power of penetrating fog, which has been expressed by many authorities—notably by Professor Tyndall, and most recently by Mr. W. F. Barratt, of Kingstown*—receives fresh confirmation by the writer of an article in the "Contemporary Review" for April (the Rev. J. M. Bacon), on "Fogs and their Teaching." Mr. Bacon was in Dover during the meetings of the British Association last autumn, and his attention was drawn to the varying power of certain lights to penetrate fog, by a remark of a coastguardsman that the flash of the evening gun from the Castle would pierce the fog which was one night enveloping the town, better than all the other lights round. "While he was still speaking, the clock struck, and, with service-like precision, a dull flare opened out on the heights, fairly eclipsing for the moment any of the gas-lamps, either single or massed (for the town was illuminated), that tried to penetrate the heavy night." Mr. Bacon—putting aside the question of why the gun-flash is supreme in its fog-piercing power—proceeds to state, "as an instructive commentary, that where the fog lay thickest the gas-flames were utterly quenching the usually dazzling arc lamps of the Electric Light Company, which was in keenest competition that week with the older form of illuminant in the town. The same fact," the article continues, "has been inferred, if not irresistibly brought home, on occasions of grave moment. When the electric light was first established at Dungeness, the Trinity yacht *Galatea* went ashore close to the light, those on board being unable to see it. Again, in 1879, the *Bast* was wrecked close to the powerful electric light at Lizard Point." (The Lizard Lights were specially mentioned last July, when the question of light-house illumination was raised in the House of Commons.†) "Again, in 1892, the *Eider* went ashore within a short distance of the electric light of St. Catherine's Point, Isle of Wight; while the terrible calamity of the *Drummond Castle* took place in close proximity to the electric light of Ushant, which (according to the evidence of the survivors) could not even be glimpsed."

The explanation of this undoubted capacity of gaslight to mitigate the darkness of a fog, and the equally certain inability of electric light so to do, is, as Mr. Bacon points out, the fact that a true fog is impervious to rays from the more refrangible end of the spectrum; and he refers to the phenomenon—often noted in the "JOURNAL," but worth substantiating from evidence of an independent witness—that "it will often be found in our London streets that the old-fashioned and much-abused yellow-burning gas-lamps will hang out a warning red beam in a dense gloom through which the actinic rays of the modern electric arc cannot penetrate at all.

Discussing the nature, characteristics, origin, and possible mitigation of fogs, in which gas managers naturally feel a business (conflicting with a personal) interest, Mr. Bacon instances the fact that the darkness produced by an overhead fog is more intense, though infinitely less intolerable, than the gloom of an enshrouding ground fog, as a proof that fogs are usually but shallow bands of mist. That this is so will be found by ascending any commanding height in a fog-bound city, such as the top of St. Paul's Cathedral, when the fog layer will be seen to reach but little above the house-tops. Another feature of the town fog is, as all our readers who live in and around the Metropolis will have remarked, its sharply defined limits—a feature which is also frequently, though not so generally, characteristic of a sea-fog. We have, in the English Channel, sailed out of a dense, dripping bank of mist into the unmitigated glare of an August noonday sun, with the suddenness of a train that is emerging from a tunnel.

"If then," says the Contemporary Reviewer, "the choking cloud lies, like a true isolated cloud, compact, continuous, and well-defined, with the additional characteristic that its depth is very shallow, it might seem reasonable to hope that, by some artificial disturbance, atmospheric equilibrium might be so far affected that the entire cloud could be made to rise, if not to disperse. . . . One method, at least, has been long talked of—namely, the disturbance of the air by the impulse of explosion. Rather more than forty years ago—that is shortly after Crimean War times—when it was a favourite practice to hold reviews on a grand scale on Southsea Common, with much heavy firing, the writer remembers it being confidently asserted among the officers that such cannonades generally brought up wind or change of weather. This indeed is a doctrine

* See "JOURNAL," Vol. LXXIV., p. 321 † *Ibid.*

very generally received, and attempts have been made to connect big battles with subsequent storms; so that were there but the germ of truth in this, it would be no extravagant idea that even a London fog might be borne up and away on the back of an eddy, say, produced by a well-ordered salute on Primrose Hill." Extravagant or not, however, we do not think that gas managers need fear the immediate abolition of fogs, with the attendant enhancement of gas consumption, through the practical application of this idea.

As to the effect of a foggy day upon London's gas bills, Mr. Bacon quotes some not altogether accurate figures. "Statistics furnished by one chief Company [about a dozen years ago] showed that 35 million cubic feet in excess were consumed on a single day of fog. . . . Adding to this the extra supply demanded at the same time of two other Metropolitan Companies, the total excess of gas amounted to 150 million cubic feet; or, put in another way, the cost of the day's fog, in gas, to London could not be put at a less figure than £7000 or £8000." As the total maximum daily consumption of the three principal London Companies a dozen years ago would have only amounted to about 180 millions altogether, and as 150 millions valued at £7000 to £8000 works out at only about 1s. per 1000 cubic feet, Mr. Bacon, or the printer, has evidently gone astray. He probably intended to say, what would be much more nearly accurate, that the excess consumption due to a day's fog was, in London, somewhere about 50 million cubic feet, which would cost, approximately, £7000.

The much more frequent occurrence of fogs in the months preceding Christmas, as compared with the later winter months, has often given rise to speculation; and Mr. Bacon suggests the most reasonable explanation thereof. It lies in the well-known facts that the presence of water at a higher temperature than the air lying over it is a constant cause of fog, and that the sea rises and falls in temperature much more gradually than the land. Every bather knows that the sea is warmer in October than in April, and every schoolboy learns the origin of sea and land breezes. It is, therefore, "easy to see how the tidal waters of Father Thames may frequently be appreciably warmer than the night air, say in early winter. In this case the river might be giving off vapour with a supply too great for the demands of the air at lower temperatures, and a precipitation of fog must be the result. During a midnight balloon voyage in autumn over the north of Kent, the writer and his companions were for a while deceived by what appeared in the moonlight to be the proximity of the sea. On obtaining a wider view, however, it was soon discovered that the phenomenon was due to a sea of dense mist overhanging the Thames, and confined, in the still air, within sharply defined limits." On another occasion, clouds were seen forming over and following the whole course of the Thames, from the sea inland. "The special interest attaching to this account is the fact that the tide had, at the hour in question, just reached its flood, and the entire bulk of warmer water had come up from the sea."

Mr. Bacon calls attention to the dryness of a "pea-soup" fog, and quotes the result of some of Professor Frankland's investigations on this point; the dry nature of the town fog being, in the Professor's opinion, due to the coating of the particles of moisture with soot and smoke—the whole compound forming the familiar yellow, greasy, foul smelling and tasting thing called a "pea-soup" fog. When we wish to look at the sun, we use a piece of smoked glass. In smoking that glass we have carried out a process similar to that by which a "pea-soup" fog obtains its murky colour. "There is no danger," Mr. Bacon humorously observes, "in such a fog, in looking one's hardest at the noonday sun."

As to the possibilities of smoke prevention or abatement, Mr. Bacon is no optimist; and, indeed, he omits entirely from consideration the already marked effect of the substitution of gas for coal as the heat-producer in cooking and room-warming. The abolition of smoke-thickened fogs by this means is indeed a consummation to be desired by all gas managers; for the steady day by day (and daylight) consumption of gas for cooking and heating purposes is infinitely to be preferred to the sudden and abnormal demand for light on the fog-blinded day, involving, as it does when the fog lasts for days together, either an impoverished supply of gas, or the maintenance of an expensive margin of storage or manufacturing plant to cope with a demand that may only arise once or twice in several years. In fact, the days of such prolonged periods of abnormal demands for gas appear, from the cause we have named, to have practically disappeared.

Working Engines with Producer Gas.—The satisfactory results which have attended the establishment of works for the generation of producer gas at Zurich and Lausanne, as well as at Orleans and Poitiers, for furnishing motive power in connection with the working of tramways, have led to the fitting up, at a new station at St. Ouen, of a number of motors to be operated by this gas. The plant consists of Charon motors of 160 and 80 horse power worked with ordinary gas, and of 120 and 60 horse power worked with producer gas. These are to be all operated by the latter gas; and the contractors have agreed to supply power at the rate of 8 c. per kilowatt-hour, including all working expenses, but not interest and sinking-fund charges, for a minimum production of 850 kilowatt-hours per diem.

DIRECTORS VERSUS AUDITORS.

THE report of the proceedings at the recent meeting of the shareholders in the Golden Grain Bread Company, is very disheartening to those who, like ourselves, are anxious for Auditors to be encouraged and required to do their duty thoroughly, and to report faithfully upon the accounts they are appointed to investigate. The Auditors of the Company in question—a high-class firm of Accountants—have in their reports, for some time past, called the attention of the shareholders to the fact that, in the Auditors' opinion, the Company's assets were overvalued in the balance-sheets, and the profits correspondingly over-stated. This view the Directors have always contested; and matters came to a climax last week, when the Board proposed to the shareholders at their meeting the payment of a preference dividend of 7 per cent., which the Auditors opposed as being unjustified by what they deemed to be the true financial position of the concern. The majority of shareholders present supported the Auditors; but, by the aid of proxies, the Directors carried their point, and, moreover, obtained the dismissal of the Auditors from the service of the Company.

These proceedings, looked at—as they alone concern us—from a general point of view, can only be described as most ill-advised and unfortunate; for they cannot but tend to discourage any but the strictest and most upright of Auditors from making a searching examination of accounts, and giving an independent, and perhaps unfavourable, report thereon. And, goodness knows, the average Auditor is by no means in want of such discouragement! So far as the particular shareholders in question are concerned, no conduct could well be more fatuous than that of paying dividends declared by a well-known firm of Auditors to be unwarranted, because unearned. It is true that the meeting was outvoted by the proxies of absentees; but the matter had been brought to the notice of shareholders generally on more than one previous occasion, and our criticisms are directed against all those, present or absent, who voted contrary to the advice of their Auditors.

Apart from the question at issue—as to whether Auditors are to be disregarded and dismissed if their report be unpalatable—the proceedings at this particular shareholders' meeting serve to illustrate afresh the possible unsatisfactory features attending the "proxy" system of voting. Doubtless the system is inevitable; but we think that the policy of Directors asking, and shareholders granting, proxies which practically take the control of affairs entirely out of the hands of the shareholders present at a meeting—where matters may perhaps, upon discussion, assume a very different aspect from that which they wore in the proxy circular—should be very sparingly adopted. For Directors to habitually enter a meeting-room with the voting power in their pockets, is, we hold, to defeat the end for which shareholders' meetings were instituted—and, indeed, denotes clearly a lack of faith in the capacity of the management to successfully encounter criticism. Shareholders, who are the most credulous and unbusiness like of creatures, are all too ready to sign any printed form sent them with a stamped envelope for its return.

OBITUARY.

The death is announced of Mr. W. CLARKE, Manager of the Shepton Mallet Gas Company.

Mr. THOMAS WADHAM, Secretary to the Barnstaple Water Company, died yesterday week at the age of about 60 years. He had been in failing health for some months.

Mr. HENRY WYATT, Secretary of the Chiltern Hills Water Company, died suddenly last Tuesday, at Aylesbury. Deceased was for many years Agent to the late Baron Ferdinand Rothschild, and was for some time Chairman of the Urban District Council.

The Directors of the Liverpool United Gas Company have lost a colleague in the person of Sir THOMAS EARLE, Bart., whose death occurred somewhat unexpectedly at his residence, Allerton Towers, Woolton, on the 13th inst. Deceased attended a meeting of the Board on the previous Wednesday, and subsequently had an attack of bronchitis, to which he succumbed. He was senior partner in the firm of Messrs. T. & W. Earle and Co., and was 80 years of age.

Bailie SANDILANDS, of Glasgow, died very suddenly at the Royal Cottage, Loch Katrine, on the morning of the 16th inst. It is but a few weeks since he was appointed Convener of the Water Commission of the Corporation, in succession to Mr. Osborne, who held the office for many years. He entered the Town Council in 1896, and was from the beginning of his connection with the body a hard worker. Last November he was made a Magistrate. His death is the third which has taken place among the members of the Council since November—one of the others being Mr. Osborne.

PERSONAL.

Mr. J. S. LUCKING, of Rhos, has been appointed Manager of the Clay Cross Gas-Works.

In consequence of failing health, Sir WILFORD BRETT, K.C.M.G., Chairman of the Buenos Ayres (New) Gas Company,

has been compelled to resign his seat at the Board. Mr. F. C. im THURN has been elected to fill the vacancy.

With reference to the announcement in the "JOURNAL" last week of the approaching retirement of the Engineer and the Secretary of the Derby Gas Company—Mr. CHARLES TAYLOR and Mr. RICHARD FISHER—at the close of the present quarter, we learn from the "Derby Daily Telegraph" that Mr. Taylor began his professional career with the Nottingham Gas Company, in whose service he spent twenty years—rising to the position of Superintendent of the Basford works. Thirty-five years ago he was invited to Derby to take the position of Engineer and Manager of the gas-works; and during his tenure of the office he has naturally witnessed a remarkable development of the undertaking. When he first assumed command, the quantity of gas manufactured did not exceed 100 million cubic feet per annum; but at the present time the output is upwards of 550 millions. The establishment of the branch works at Litchurch has taken place under Mr. Taylor's supervision; while during the same period the Company's premises in the town have also expanded enormously. Mr. Fisher entered the service of the Company more than fifty years ago as a junior clerk; his father at the time holding the office of Secretary. Working his way up, he was, in later years, appointed as his father's assistant; and upon that gentleman's retirement in March, 1883, his son was called upon to succeed him. We learn that it is the present intention of both Mr. Taylor and Mr. Fisher to continue to reside in or near Derby. As mentioned last week, the Directors of the Company are inviting applications for the position vacated by Mr. Taylor; but no intimation has been given as to the Secretaryship.

NOTES.

Lightning and Electric Lamps—A Correction.

In the "JOURNAL" for Feb. 26 last (p. 467), there appeared a "Note" describing a remarkable photographic record of what was supposed to be an effect of lightning on the public electric lighting installation of the Dover sea-front esplanade. The observation was also made, on the authority of Sir G. Stokes, that these photographic experiments showed that such electric street lighting plant was probably a good thing to keep away from during thunderstorms. Naturally, other technical periodicals published the same warning. It is only right to report, with equal prominence, the fact that Sir G. Stokes has recently withdrawn this observation, on being convinced that the photographic records in question were vitiated by careless movements of the camera. The natural result was to show trails of light from the electric lamps. Such an exposure—using the word in more than one sense—is calculated to furnish legitimate ground of complaint on the part of those who reasonably assume that published experiments have been properly conducted. Careless manipulation of a sensitive photographic plate is very liable to produce startling results; but these are usually only heard of, if at all, in the comicalities of popular magazines. Lightning effects are all too serious to be groundlessly called in question in connection with electric lighting fittings, or any other common street objects.

The Trade in Magnesite.

Further particulars have transpired, in Consular reports and otherwise, of the development of the magnesite industry of the Greek Island of Euboea. This mineral makes a very high-grade fire-brick, for which manufacture last year from 30,000 to 35,000 tons were exported in the crude state, of which 20,000 tons went to the United States, where it is in great demand on account of its purity. The raw rock shows 97 per cent. of carbonate of magnesia, with but a trace of iron, and very little silica. The largest owners of the Greek magnesite deposits are: M. Bodouri, the present Minister of Marine; the Society of General Enterprises; and the Society of Public Works, Athens. Besides these, there are many smaller proprietors. There is a large tract of this mineral land for sale in Euboea; and M. Christomanos, Professor of Chemistry in the University of Athens, is the repository of information concerning the terms of sale, &c., of these properties. Actually, the mineral is put on board at the nearest harbour for 23 frs. per ton; and the duty and freight to England are nearly as much. It is suggested that those who are deeply interested in the trade in this and other refractory materials would do well to buy a mine outright. It is more economical to calcine the rock on the spot, and so get rid of the carbonic acid. It carries well in the calcined state; and not the least recommendation of it is that it can be ground after use, and worked up again any number of times.

The Latest Puzzles of Actinism.

Incessant work is being done, principally by French chemists, upon the so-called radio-active elements, the existence of which was first made known by M. Becquerel. It has been well said that if it had not been for the previous discovery of the Röntgen rays, that of the Becquerel rays would have ranked as the most remarkable scientific event of the century. These rays appear to emanate from the originating substances without causing the latter any loss. Like the Röntgen rays, they have their own standard of opacity, and readily pass through cardboard and wood. Becquerel found that uranium exhibited this property of radiation in a high degree; and afterwards that thorium, so well known in connection with incandescent lighting, possessed it. More recently, M. and Madame Curie found radio-active constituents in Bohemian pitch-blende; and these were identified as compounds or varieties of bismuth and barium. It is yet doubtful whether these substances are elementary. Owing to the Becquerel rays being susceptible to magnetic deflection, it has been argued that they must be material. Other workers in this field have connected the phenomenon with fluorescence; and lately M. Debierne has announced the separation of a new radio-active element, which he calls "actinium," and describes as being allied to thorium. The action of any of these substances is very slight, compared with that of the Röntgen rays; but, on the other hand, the difference of the amount of energy involved in the respective effects is enormous.

Refractory Furnace-Linings.

Mr. Edward Duryee, the Chemist to the California Portland Cement Company, has published some observations on the behaviour of refractory furnace-linings under various conditions. He remarks that the character of the lining should be determined by the nature of the service required of it. This would seem to be an axiomatic principle; but in practice its violation has caused the failure of many furnaces. A platinum crucible will hold a slag of silicate of lime or soda for any length of time at the highest temperatures; but the addition of lead will cause it to melt quickly. The durability of fire-brick largely depends upon what is brought into contact with it. For cement kilns, Mr. Duryee finds that the best bricks are those which in composition approach most nearly to kaolinite. He makes a kiln-lining of bricks composed of one-third high alumina clay and two-thirds ground old fire-bricks. The bricks are moulded by hand, and are not pressed; and after being lightly burnt, they are dipped in boiling coal tar. When built into their places, these tarred bricks are washed over with a fusible slip of salt glaze, which melts easily and prevents the carbon from being burnt out too readily. It appears to be a strong point with this chemist that fire-brick should not be burnt too hard, but only just enough to prevent subsequent shrinking. He is also in favour of grinding up and working over old fire-brick; for some purposes mixing the material with molasses. This "mix," as he calls it, is boiled and tamped in while hot, when the moisture from the molasses is nearly expelled. A salt glaze is applied to the surface, in order to prevent the carbon from burning out of the molasses.

Steam-Heat Distribution.

One of the most useful of the services that competent technical journalism can render to its supporters, is the following-up of records of technical work and experiments. Much of the information that becomes public property through the agency of print relates to things that are about to be, or have recently been, done; and very often nothing more is heard about them, so that it never transpires whether they are successful or the contrary. For this reason, the "Engineering Magazine" is to be commended for returning to the subject of the important steam-heating plant at Dartmouth College, Hanover, N.H., a description of which, taken from our contemporary, appeared in the "JOURNAL" for July 25 last (p. 230). It is now reported that the distribution of steam has proved successful, with the system already described, draining back to the boilers, which are situated at the lowest level of the establishment. During the past winter, the outside temperature fell on the coldest day to 23° Fahr.; but the drop in the steam pressure was only ½ lb. The pressure in the mains is 20 lbs., but is reduced to from 3 to 6 lbs. at the buildings. The lowest pitch of the pipes is about 0·63 inch for 10 feet. In connection with these long lines of pipe, there are a number of details of construction, chiefly designed to provide for expansion and contraction. This was done in various ways, conforming to the general idea of avoiding strains on the pipes. The greatest movement of the longest line is 6 inches. It is noted that the actual expansion for the long pipes is only from 75 to 80 per cent. of the calculated amount for a solid bar.

The Melting of Coke in Liquid Lime.

In many operations of industrial chemistry, it is important to take account of the degree of subdivision in which materials are submitted to treatment. Sometimes all the difference between success and failure rests in variation of the size of pieces or drops brought into contact with one another. A lesson on this subject is given in some observations of Carlson on the degree of pulverization of the raw materials in the manufacture of carbide of calcium. In the first place, this process consists in heating up a mixture of coke and lime, which is very similar to what has to be done for other objects. Carlson points out that the temperature of formation of calcium carbide is decidedly lower than that of the electric furnace, and that lime also melts well below this temperature. The product of the reaction is, further, a solvent of both lime and carbon. The process of the formation of calcium carbide should be as follows: The lime should melt first, and the coke dissolve in it, with the production of calcium carbide. This reaction is absolutely analogous to that which takes place between iron and dilute sulphuric acid. A solid body dissolves in a liquid with the evolution of gas—in the case of dissolving coke, the gas is carbon monoxide. In the

actual manufacture, pieces of coke the size of a nut are best for the purpose. The gases produced pass off freely throughout the mass, which they warm up, and escape from the furnace at a maximum temperature of 1000 to 1100° C. As the temperature of the electric arc is generally from 3000 to 4000° C., there is a considerable excess of heat. It is claimed that a ton of carbide can be made from 1590 kilos. of coarse raw material.

Ferruginous Incrustations in Water-Pipes.

Dr. Pellegrini recently made a communication to the National Congress of Hygiene of Turin regarding the ochreous deposits which are frequently found in water-pipes to such an extent as to completely obstruct them. The object he proposed was to study whether in these more or less ferruginous deposits of water the *Crenothrix* exerted a special biochemical action, determining precipitation of the iron, and contributing to the obstruction of the pipe. For this, he studied the ochreous formations peculiar to cast-iron pipes, and endeavoured to ascertain whether traces of *Crenothrix* are always found; whether other filamentous micro-organisms can grow there and produce ferruginous incrustations; and, finally, whether, granting the presence of these microphytes in the pipes, the tuberiform formations should be ascribed exclusively to micro-organic origin, or whether these deposits merely prepare a favourable ground for the growth of ferro-bacteria. Numerous experiments and analyses made with water taken from various sources has led the experimenter to conclude: (1) That the ferruginous tuberiform incrustations can form without the existence of the *Crenothrix*. (2) That this is not the only micro-organism which can grow in water-pipes and become impregnated with ochreous deposits. (3) That, whatever the participation of the ferro-bacteria in this phenomenon may be, it is not necessarily due to the abundance of iron salts in the water. (4) That the rugosity of the sediments causes a relative stagnation of the water, and is the indirect cause of obstruction with which the *Crenothrix*, or some other similar micro-organism, co-operates. Dr. Pellegrini recommends coating the interior of the pipes with varnish or coal tar, so as to prevent all chance of obstruction.

Refilling Colliery Workings.

A remarkable story of economical coal working by the aid of the process known as "culm flushing," has been told to the Franklin Institute of Philadelphia by Mr. W. Griffith. It is another illustration of the straits to which the exhaustion of the most easily worked, and consequently cheaper, coal seams is putting colliery proprietors in the United States as elsewhere. It appears that from 15 to 20 per cent. of the product of the anthracite mines, according to the methods of the past, was wasted in the form of powder, and therefore put away in vast piles of so-called "culm," which form mountainous heaps in the vicinity of the pits. Of late years, improvements in the methods of burning small coal have led to many of these heaps being worked over again; while the coal-breakers do not make so much waste as formerly. Consequently, the output of culm is checked; but still a good deal of it is unavoidably produced, only to cumber the ground, which is in places of considerable value. The expedient has therefore been adopted of washing the dust coal, or culm, back into the abandoned workings of the mine, where it acts as a filler. This is effected in the crudest way, by conveying the culm from the coal-breakers, or the pile, to a hopper on the end of a 3-inch pipe leading down to the old workings. A stream of water is turned on to the same pipe; and thus the small coal is washed down. This arrangement recalls projects that have been ventilated for conveying coal in bulk in the same way from the pits to gas-works and other centres of consumption. The water, after carrying down the coal to its destination, drains away to the sumps, whence the mine pumps lift it again. It is stated that the culm in this way gradually fills the old workings with a firm, resisting deposit. Eventually, it is expected that this deposit will take the weight of the old roof, and thus release the coal left to form the old pillars to be mined in its turn.

The Russian Coal Difficulty.—The Foreign Office have just received from H.M. Ambassador at St. Petersburg a despatch transmitting extracts from an article published in the "Industrial World" of that city on the subject of the coal crisis in Russia. After tracing the history of the imposition of duties on foreign—which is to say chiefly English—coal, the writer of the article asserts that the results of this protection of the home trade have been particularly deplorable in the South, where, for ten years at a stretch, a coal crisis has been going on. The prohibition of foreign coal on the railways has raised the price of fuel for the population as well as for the railways themselves. In the Black Sea and Baltic ports, this has been very sensibly felt, and one of the consequences of the cessation of coal imports into the Black Sea has been the rise of freights on grain. It would appear that the coalowners have not justified their promises that, should duties be imposed on foreign coal, Russian coal would come down in price everywhere. Cheap coal and naphtha can be obtained only by, first, the entire abolition of duties on coal, coke, briquettes, and every sort of fuel; and, secondly by permitting the railways to use whatever fuel may at any moment be most advantageous to them. The article concludes with the assertion that without the abolition of the duties on coal—which have been partly suspended—all the expenses of new avenues of communication, &c., will be for the advantage, not of the consumers, but of the mineowners and dealers.

TECHNICAL RECORD.

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

The Twenty-third General Meeting of the Association was held last Wednesday, at the Lion Hotel, Cambridge, under the presidency of Mr. HARRY WIMHURST (Sleaford). There was an average attendance of members, among whom were several of the recently elected. A light luncheon preceded the business proceedings, which were throughout of an eminently useful and satisfactory character. On the President taking the chair,

The HON. SECRETARY (Mr. J. H. Troughton, of Newmarket) read the minutes of the meeting held at Sleaford in September last; and they were confirmed.

A WELCOME.

The PRESIDENT introduced the Chairman of the Cambridge Gas Company (Mr. E. Parker), and invited him to address the members.

Mr. PARKER, in appropriate expressions, heartily welcomed the Association to Cambridge; and proceeding to refer to matters affecting the industry, he said he thought there were serious questions ahead, especially in regard to the price of coal and the consequent price of gas to the consumer. A rise in coal of from 5s. to 6s. a ton must of necessity compel almost all gas companies to increase their price for gas. He could not himself see how it was to be avoided in justice to the shareholders, who had a right to expect a certain amount of interest for their money. The interest paid did not seem to him to be, in most cases, at all excessive at the price which gas stock now commanded. For a risk such as gas stock, shareholders were entitled to expect to receive from 4 to 5 per cent. on their money; and he could not see how sufficient was to be earned to pay the dividend unless the price of gas was considerably increased, so long as the price of coal was anything like it threatened to be. The Cambridge Gas Company were not under the sliding-scale; and this he personally thought was a mistake. He considered that in bad times, consumers and shareholders, being to a certain extent partners, ought to suffer together. Another question of great importance to gas managers was that of adopting such labour-saving contrivances as inclined retorts. At Cambridge, they had satisfied themselves—under the advice of their Engineer (Mr. R. Brown), and this was fully confirmed by Mr. Livesey—that, provided the right kind of coal which did not creep could be obtained, inclined retorts were the very best things that could be had. They had now five beds of these retorts; and their policy would be to increase the number as soon as they could. They were somewhat handicapped at the present time owing to the great increase in the price of iron and building; but as soon as they had a good opportunity, they would extend the inclined settings. Regarding the public lighting of streets, he was convinced that the incandescent gas-light was far preferable to the electric light; and, in his opinion, it was most important for gas companies to initiate a policy of effective street lighting.

REPORT AND ACCOUNTS.

The annual report and accounts were, on the suggestion of the PRESIDENT, taken as read. The former was mainly a record of the proceedings of the year. In a reference to the President's Inaugural Address at the last meeting, the Committee observed that it was pleasing to note, in connection with his remarks as to the fusion of the Gas Institute and Institution of Gas Engineers, that it seemed likely to become an accomplished fact at no distant date. The report also stated that the year commenced with a membership of 66. One member had resigned, and two had severed their connection with the Association by the operation of Rule 19. Three new members were elected during the year; leaving the total membership as it was—viz., 66. Six associate members were enrolled at the autumn meeting, under the new rule. The accounts showed that a balance of £38 5s. 3d. was brought forward; and subscriptions paid during the year amounted to £32 0s. 6d.—making a total of £70 5s. 9d. The expenditure had been £35 16s.; and this left a balance in hand of £34 9s. 9d., and a few subscriptions outstanding. The Committee appealed to the members to take a greater interest in the Association by volunteering papers, nominating additional members, and attending the meetings regularly.

NEW MEMBER.

On the motion of the HON. SECRETARY, seconded by Mr. J. G. HAWKINS (Spalding), Mr. A. J. Jackson, of Royston, was elected a member.

INCANDESCENT STREET LIGHTING.

The PRESIDENT, in calling upon Mr. J. H. Sheldrake, of the Welsbach Incandescent Gas-Light Company, to read his paper on the above subject, said he thought, after the members had heard the paper read, they would consider they had acted wisely in forming the class of associate members, and inviting such gentlemen as Mr. Sheldrake to join.

Mr. SHELDRAKE then read his paper, as follows:—

The subject of this paper should, at the present time, be of some interest to gas engineers, and others concerned in the lighting of our public thoroughfares; and my object in placing the matter before you is to give a few practical hints, which may be

of use to those who have not had much experience in this form of lighting. Many failures have been recorded, arising from insufficient knowledge of technical details by those who have had a new form of lighting placed in their hands. In a great number of towns, I am happy to say, these difficulties have been overcome, through the energy and skill shown by those who had the subject under their superintendence.

To show the enormous strides which have been made during the past twelve months in incandescent gas street lighting, I am in a position to state that upwards of 67,800 lamps have been altered from flat-flames to incandescents; and I venture to say that, in the coming year, these figures will be far exceeded.

Lighting authorities in this country, who have been willing in the past to allow 5 cubic feet per burner for street-lamps, now show a disposition to take advantage of incandescent lighting, by using burners of a small size, instead of giving the public the benefit of the extra light which could be obtained. I think this system is one which all gas managers should fight against; and no burners consuming less than 3 cubic feet of gas should be recommended.

As to the distance at which lamps are fixed, there is no settled measurement; each town or district adopts its own distance, to suit the requirements or the pockets of the ratepayers. In some suburban parts of our cities and towns, however, there is no doubt that the lamps are fixed too far apart; whereas, in main roads, where they have the assistance of shop lighting, they are put much closer.

With regard to the lamp-posts themselves, in all new installations it is very important to have lamp-posts of strong pattern, and well fixed into the ground, at a distance from the kerb, so that no vehicles passing would be liable to touch them. In the past, lamp-posts were fixed close to the edge of the kerb; and, from my experience, when these lamps have been fitted with incandescent burners, the breakage of mantles has been very great. But this is a matter which is being rapidly altered, and is not likely to be a trouble in the future. There is one thing, however, to which I earnestly call the attention of gas engineers, and that is the design of the pillars they order. Why do they stick to the old octagon, fluted, and other similar patterns, when, for a few shillings more, nice designs and good castings can be obtained? At the present moment, I think I am right in stating, there are more old-pattern lamp-posts sold than any other. This is a subject which, I think, ought to be seriously considered when new roads and districts are being lighted.

Here, in England, the policy has been to buy a lamp-post, lantern, cradle, lever-tap, and governor all for about 42s. Surely, those days ought to be now past. On the Continent, you will find, they spend from £8 to £12 on every lamp that is fitted. Independently of this, they are always kept clean (I refer to the lamp-pillar as well as the lantern); and anyone who has visited Paris or Berlin, and such cities, must have been struck with the fine appearance of their street lighting.

Lanterns.—The great point in a street-lantern for incandescent lighting is the ventilation. It is no good whatever attempting to fix incandescent burners in ordinary street lanterns, where the top of the lantern is open, or there is a pane of glass out at the bottom, which has, in the past, been used for the torch. The bottom of the lanterns should be closed as much as possible—in fact, if it can be closed altogether, it will be all the better. The top of the lantern should have an inner chimney with a cone at the bottom over the burner. By this means, the hot air from the burner escapes up the inner chimney and out at the top; and any down-draught which might find its way into the lantern from the top, is diverged by the cone, and does not affect the mantle. All existing street-lamps (where it is not desired to have new ones) can easily be altered in this manner, though I think it very important that we should get away from the old 14-inch street-lantern, which has been in existence from the earliest days of gas lighting. They should not be less than 16 inches square, as, in such lanterns, there is a larger capacity, and the mantles are not likely to be affected by the draught, as they would be in a smaller one. Besides, a lamp of this description is more imposing in appearance.

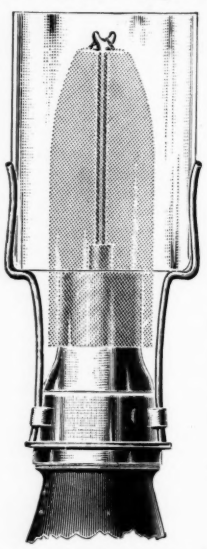
Burners and Anti-Vibrating Arrangements.—I now come to an important part—viz., the burner. From past experience, it has been proved that some form of anti-vibrating arrangement must be used. There are instances where they are not employed; but I think you will find that, in these cases, the lamp-posts have been of a very strong pattern, and not subject to much vibration from the traffic. I consider any form of anti-vibrator which has flexible india-rubber connections is not one which gas engineers should seriously adopt. The mere fact of a flexible connection to a street light does not give me the impression of its being a workmanlike job when fitted. Independently of this, there is the great risk of leakage—which would possibly destroy the lamp—caused either by carelessness or by the india-rubber perishing. This form of anti-vibrator has been extensively used; but I venture to think that an anti-vibrator which has nothing but metal parts is one which must commend itself for wear and tear.

A form of anti-vibrator, of which I have had considerable experience lately, is Chalmer's. This, when originally put on the market, had an asbestos washer in the head of the burner, to prevent the air from the outside of the bunsen tube passing into the head of the burner, and thus spoiling the quality of the flame. Experience has proved, however, that this washer, by its continual action, is liable to wear away and let in an admixture of more air—reducing the calorific power, with the result that the mantles do not give anything like the illuminating power they should. This, I am happy to say, has now been overcome by the introduction of a metal ferrule and washer, which takes the place of the asbestos, with the result that a good flame can always be maintained; and I should strongly recommend gas engineers who have any of the original form of anti-vibrators under their charge, to have them altered. In fixing the burner in the lantern, great care should be taken that it is perfectly vertical, and that the spring works freely, so as to give the full amount of resiliency.

Governors.—The question of suitable governors for incandescent lighting is one which requires care in selecting. They should be constructed to give a pressure on the outlet of not less than 10-10ths. Many that have been tested only give 6-10ths to 7-10ths, which is not sufficient to secure the full efficiency of the burners; and, therefore, disappointing results are given, which are no doubt blamed to the mantle.

Mantles.—I now approach another important part, and that is the mantle. For the present, I do not wish to mention any other than the Welsbach, because I do not know how far I should be looked upon as an infringer, if I ventured to mention any other form of mantle until it had a legal existence. I believe, however, that the Law Courts, within a very short time, will settle this matter. But quite apart from any legal decision, improvements in Welsbach mantles are about to be made by the Welsbach Company as the result of a number of important experiments.

My wish is to call attention to the fact that mantles which are now used for the various sizes of burners should be fitted the regulation distance from the top of the burner. We all know that the magnesia forks which are used vary in length; but, if care is taken to have these the right size, and firmly fitted into the top of the burner (I recommend always that a small piece of fine asbestos thread be just pressed in with the fork), the mantle will last much longer than if it is fitted on a loose, shifting fork, the effect of which is that, when the burner is alight, the mantle is always on the move, and, consequently, wearing away at the bottom. I strongly advise everyone to look to this; and I may say that I think, before long, forks of a different pattern will be adopted, the lower part of which will be in the form of a cone.



It is important that all incandescent burners should be, at every opportunity, cleaned out, so that no thick deposit of dust is allowed to accumulate in the interior. This is always apparent by the flame of the burner rising above the mantle; also by the blackening of the top of the mantle, and consequent loss of illuminating power.

Glass Protector.—Never attempt to use mantles without a glass protector. This has been recommended in the past; but I strongly advise everyone to see that some protection is given, not only to protect the mantle from draughts, but also during the process of cleaning the inside of the lantern. I have recently been experimenting, with the idea of finding out the best glass that can be used; and I am pleased to say that I have found a form of glass which will not only prolong the life of the mantle, but also give a considerable increase in illuminating power.

The burner used was a No. 4; and I find the following were the results:—

	Pressure.		Percentage Increase in Light over Unprotected Mantle
Mantle protected with the ordinary bulb globe	1·0	..	2½
	1·5	..	4
	2·0	..	4
Mantle protected with new form of glass .	1·0	..	18
	1·5	..	20
	2·0	..	18½

Lighting.—With regard to the means of lighting, personally I prefer the bye-pass with the automatic cock, which, when the burner is alight, turns out the bye-pass. Unfortunately this form of tap is often abused by having the flame too long, or not under control with regard to the pressure. Two screws, however, have been introduced in the bye-pass, so as to check or minimize the excess pressure; but, anyhow, these bye-pass jets should not consume more than 0·3 cubic foot per hour. Working this out, with gas at 3s. per 1000 cubic feet, and allowing for an average of 3000 lighting hours—which, of course, varies according to the different localities—would mean a consumption for the year of 1728 cubic feet, costing 5s. 3d. for each bye-pass.

There have recently, however, been introduced several systems, one of which is the patent arrangement of Messrs. Simmance and Abady, whereby a tap is so constructed that, by giving it one movement, the torch is passed through the flap at the bottom of the lamp, and lights the bye-pass jet. The torch is then withdrawn, and the tap is given another turn, which lights

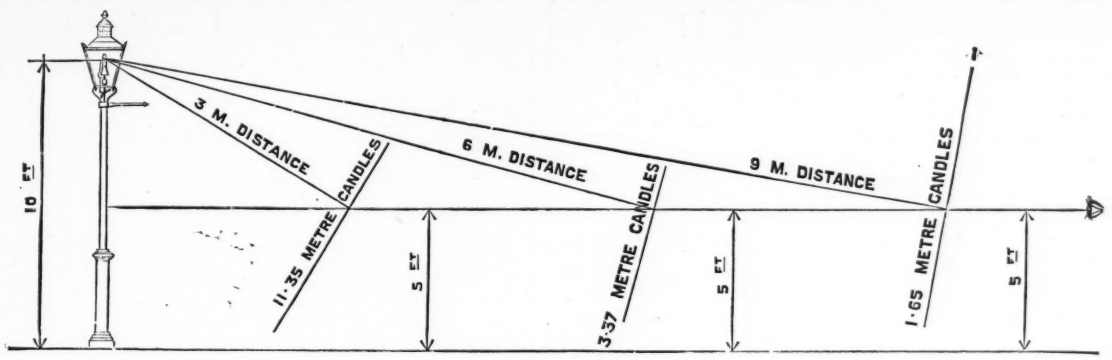


DIAGRAM A.

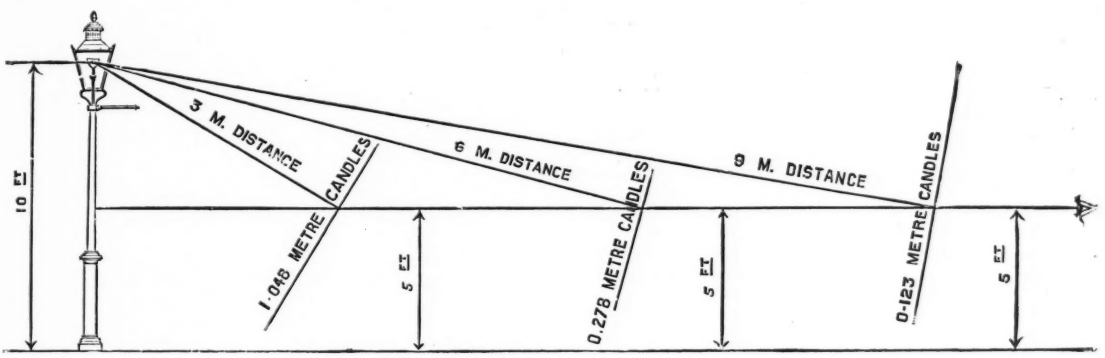


DIAGRAM B.

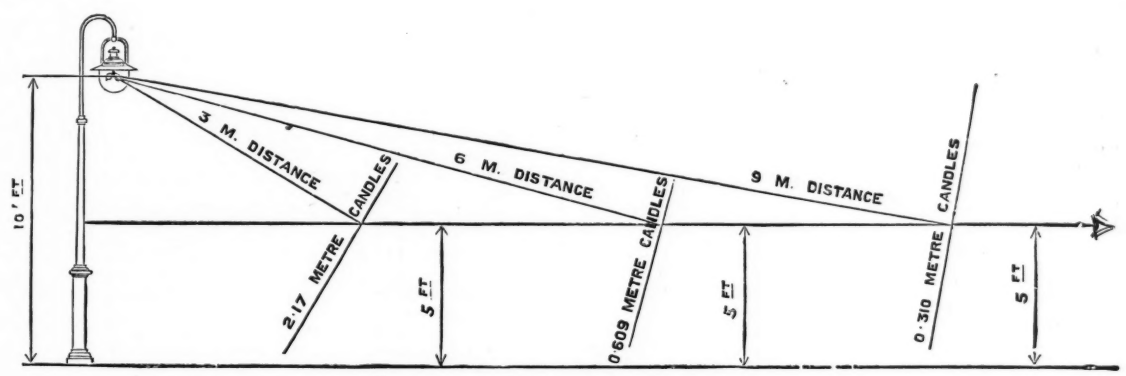


DIAGRAM C.

the burner and extinguishes the bye-pass. This works very well, and, no doubt, will find favour with many.

There is also a torch, working upon a hinge, which can be inserted into the lantern, and thrown at an angle over the top of the burner. This is a form which, I believe, has now been perfected and brought out by Mr. G. F. L. Foulger, of the Gaslight and Coke Company; and, no doubt, many of you have had particulars of it.*

Of course, with the torch form of lighting, it is necessary to have a flap at the bottom of the lamp, hinged from the centre. But there is, I think, considerable risk of danger to glasses and mantles, unless great care is used by the lamplighter when inserting the torch.

Cost of Mantles.—The cost of mantles has been, in some districts, a very important item. Not only were the lamp-posts close to the kerb, but the stand-pipe was not central, and was quite loose in the column; and the consequence was that the least vibration in the road affected the mantle in a very serious manner. In other districts, I hear of only about 1½ mantles being employed per annum per burner. This is a very low average, and shows great care in their use. I think, however, that, with all the latest improvements in the anti-vibrator, and the proper fitting of the mantles to the burners, an average of 4 mantles per annum (with the new form of glass) would not be excessive, considering the high results which are obtained. In every case, it should be insisted upon that an anti-vibrating arrangement should be used.

Lighting Efficiency of Different Burners.—I have recently been assisting at some tests to determine the lighting efficiency or diffused light given by different burners at various distances. The first which was tested was one of the "Westminster" lamps, which had a Kern burner, No. 4 size, fixed at a height of 10 feet from the ground. Several readings were taken at 3, 6, and 9 metres distance from the light at a height of 5 feet from the ground. The photometer used was of German manufacture, and is known as Professor Weber's. At a distance of 3 metres, the light given was 11·35 metre-candles; at 6 metres, 3·37 metre-candles; and at 9 metres, 1·65 metre-candles. These figures [see Diagram A], therefore, state the actual useful light furnished by a burner which was giving about 106-candle power. In a burner of this class, of course, the light given in every direction would be the same.

I afterwards substituted for the Kern burner a 5 feet Bray's burner, which consumed 5·1 cubic feet of gas per hour; and I found the light given from this, at 3 metres distance, to be 1·048 metre-candles, at 6 metres 0·278 metre-candle, and at 9 metres 0·123 metre-candle [see Diagram B].

To follow up these experiments, it occurred to me that it would be very interesting indeed to know how Mr. Smithard, of King's Lynn, fares with his electric light; and I therefore sent down to test under the same conditions as those under which the previous experiments had been carried out. I found that there were two nominal 16-candle power incandescent lamps in each lantern; and, upon testing their photometrical power, they were found to give 24 actual candles. Upon testing these at 3 metres distance, an effective candle power was given of 2·17 metre-candles, at 6 metres distance 0·609 metre-candles, and at 9 metres distance 0·310 metre-candle [see Diagram C].

To prevent any misunderstanding with regard to the figures which I have given, I think it right to mention that the candle power shown at the various distances represents the light of a corresponding number of candles, if placed 1 metre from a screen fixed at the distances mentioned.

With these figures before us, it is now possible to form some reliable opinion as to the actual cost of street lighting by the three systems tested. Presuming gas to be 3s. per 1000 cubic feet, which will do for illustration, the cost of the No. 4 Kern

* An illustrated description of one form of the arrangement referred to appears in our "Register of Patents" to-day, p. 1063.—ED. J.G.L.

burner will work out at 12s. 11d. per 1000 hours. In this calculation, I have allowed for the bye-pass. With a 5-feet flat-flame burner, the cost for a similar period would be 15s.; and with electricity at 3d. per unit, the cost would be 30s. At King's Lynn, the cost is 5½d. per unit. I have taken the price for electricity at 3d., which is, I consider, the lowest figure at which it can possibly be supplied at a profit.

To sum up the above results, the difference will be more apparent if I mention that to obtain 106 candles by the use of a Kern burner, it costs 12s. 11d. per 1000 hours; with a flat-flame burner, giving a light of about 10 candles, the cost would be 15s.; or with electricity, giving a light of 24 candles, the cost would be 30s. for the same period. These figures will, I think, prove that gas engineers, by adopting the incandescent gas system of street lighting, are going in the right direction.

In conclusion, the position between gas companies and municipal authorities is not always of the happiest; but, with regard to street lighting, I think that, in view of the competition which may or does occur, gas companies should endeavour, by all means, to meet them in as liberal a spirit as possible. The effect of this is seen in the spirited policy of the South Metropolitan Gas Company.

Discussion.

Mr. W. J. Best (St. Ives) remarked that Mr. Sheldrake had certainly preached from his own point of view; but, in his (the speaker's) experience, there were many places where the incandescent mantle would not answer. In hotels, for instance, where carpets were frequently being taken up and swept, dust got into the mantles and burners, and there they were more or less a failure. He was not for a moment depreciating incandescent gas lighting, because he thought it the light of the future.

Mr. W. D. Child (Romford) remarked that there was no doubt the incandescent gas-light had enabled gas companies to hold their own to a very great extent against the competition of other lights; and this they would have had considerable difficulty in accomplishing in any other way. Therefore, they were glad to receive from Mr. Sheldrake any suggestion that would assist them to utilize this splendid light to the best advantage. He agreed with him that gas companies should not avail themselves of the smaller quantity of gas required to give a high illuminating power, by cutting down the consumption. They had far better avail themselves of the greater intensity and effect in lighting that might be obtained by using (say) 4 cubic feet of gas per hour instead of the ordinary 5 cubic feet, and so show what really good and effective street lighting could be secured by simply changing from flat flame to incandescent burners. Mr. Sheldrake went on to speak of lamp columns. Those managers who had not rapidly advancing towns could not think of changing from the old-fashioned column at the same time that they adopted the incandescent burner; but in districts that were growing, of course they could gradually introduce well-designed styles of lamp columns, and put the old-fashioned ones into places where they would not be so noticeable. He did not think that anyone but a handy man or amateur would fall back upon an india-rubber connection. An engineer would quickly endeavour to devise some kind of connection which would be suitable for an anti-vibrator burner. When he first tried the incandescent light, he used an india-rubber connection; and he soon found that where he saved two mantles, he destroyed two burners and lanterns. As to the length of the forks for supporting the mantles, he believed Mr. Sheldrake said they varied; but when the Welsbach Company supplied new burners, they certainly ought to provide the best appliances for using them. He had himself, in making experiments with the incandescent burner, been tempted to break a piece off another fork and put it into the socket made for it, so as to utilize the mantle to the fullest extent; and he had an idea that he obtained a better illuminating power than was given by a mantle on the length of fork usually sent out by the Company. He thought it was the Company's duty to determine what length of mantle would give the best illuminating power with the quantity of gas they recommended should be consumed, and to supply the right length of fork, rather than leave the gas manager to use indiscriminate lengths.

Mr. J. T. Jolliffe (Ipswich) said his experience led him very much to re-echo every word that Mr. Sheldrake had said, except perhaps that he (Mr. Jolliffe) was not a great believer in the Kern burner. He had not yet been able to get any really satisfactory results that would justify him in discarding the "C" burner for the Kern. But he did think that anyone who was going into this question might with advantage abandon the bulb glass, and use the perforated chimney that had been brought out by Messrs. Falk, Stadelmann, and Co. With this alteration, he found a very considerable gain not only in lighting effect, but also in the duration of the mantles. In his paper, the author stated that somebody was trying to get down to 1½ mantles per lamp per annum. He (Mr. Jolliffe) should say, "Don't." Their object was to light the streets properly, and by cutting down the mantles to so low a figure as that, they would not get the best possible results. All the members present knew as well as he himself did, that the lighting effect of the Welsbach, or any other mantle, seriously diminished after any lengthened period of lighting. Therefore, he said, "Use your mantles liberally." He did not think that less than six per annum should be attempted. He knew that this was a costly matter; and it would be a very important thing for gas companies if the Welsbach Company would reduce the cost of their mantles. It seemed to him an astonishing thing that in Berlin one could buy mantles for 2½d. apiece; while the retail price in England was 1s. each. There did not seem to be anything at all to account for such a mighty discrepancy. He daresay many of the members had (he had himself over and over again) been offered mantles from Berlin at a fraction over 2½d. each. He had tried these mantles, and while he would not say they were quite as good as the Welsbach, they were nearly so. If the Welsbach Company, instead of spending so much money on law, would supply cheaper mantles, it would be an advantage to gas companies and to themselves.

Mr. R. Brown (Cambridge) said the paper was one with which they could nearly all agree. Regarding corporations cutting down the gas consumption to the lowest possible figure, that had been their experience in Cambridge. He tried to introduce the No. 4 burner, so as to obtain the best possible light; but the Corporation insisted on having the No. 3, in order to lessen the consumption of gas. In his opinion, no burner should be allowed in any public street of a size smaller than the No. 4 Kern. Mr. Jolliffe had spoken of the Kern as not being so good as the "C" burner. His (Mr. Brown's) experience was directly opposite. After having had experience with Nos. 3 and 4 Kerns, he would never advise anybody to go in for the "C" burner; the results obtained were very much greater. Mr. Sheldrake had taken them to task a good deal on the subject of lamp columns. Of course, the columns had not made the same progress as the other fittings; and this was not the first time they had been held up to ridicule. He believed it was Mr. Marshall who, at a meeting of the Institution of Gas Engineers, referred to the London gas-lamp posts as monstrosities. Mr. Sheldrake himself said they had been buying all they required for 42s. each; and he then advised them to spend £8 or £12. This would mean extra capital and interest, which would add to the cost per lamp per annum; and he did not think the corporation was yet born who would be prepared to pay extra for any improvement they made in the lamp columns. He agreed that to use ordinary street lanterns for incandescent lighting was simply to court disaster; but whether they could be easily altered for the purpose depended on the character of the lamp. In his case, the lanterns were very old. It would be difficult to alter them; and they would not be a success. If a lantern required a new bottom and top, he thought it better to purchase a new one. He admitted that a No. 4 Kern burner required a 16-inch lantern; but 14-inch lanterns would do equally well for No. 3 burners. As to governors, he was much in doubt as to whether they secured the advantages claimed for them. Concerning the number of mantles used, he did not intend to try to get down to 1½ per lamp per annum, as what they wanted to do was to give the public as good a light as possible. In his case, the average had worked out to 9 per annum; but this was with incandescent lighting only in the main streets. Now that they were lighting the bye-streets, the mantle account would be much less. He thought the glass protector was a great improvement on the ordinary bulb, and he should probably recommend his Board to adopt it. The question of the bye-pass was one that had exercised the minds of both himself and his Board, as to whether they should do away with it altogether. The author had mentioned the torch arrangement of Messrs. Simmance and Abady; but he did not appear very enthusiastic about it. It seemed to him (Mr. Brown) that there would be very great risk in using a torch inside a lantern containing incandescent mantles, as they could not make lamplighters do the same as they would do themselves. He thought that if the bye-passes were improved, so as to give not more than ⅛-inch jet, it would be a great benefit.

Mr. E. W. Smith (Chelmsford), while complimenting Mr. Sheldrake on the excellence of the paper, said there were one or two points he could not quite agree with. Speaking of the distance at which lamp columns were fixed, the author pointed out that in main roads, "where they have the assistance of shop lighting, they are put much closer" than in other parts. Did he understand the author to mean that they were too close, because, if so, he would point out that they must have regard to the times the shops closed. Unless the lamps were kept a reasonable distance apart, he was afraid that, on Sunday evenings and after the shops were shut, they would find there was not sufficient light. He agreed with previous speakers that gas companies could not discard their old-fashioned lamps. The lanterns were a considerable item; and they must continue to use them, or adapt them to the newer form of lighting. As to the new glass protector, in the old days of incandescent lighting they were told they must use chimneys 9 inches long to get the best results. His experience had tended in the other direction; the shorter and wider the chimney (to a point), the better the light obtained. He was inclined to think the alteration proposed by Mr. Sheldrake was a very good one. At Chelmsford, the lighting in the town itself had been for many years done by electricity; and he had been informed recently that the charge per lamp per annum for incandescent electric lighting was £2 6s. 8d.—that was used throughout the year. He mentioned this because he did not see that the author had told them the consumption of the No. 4 Kern burner; and it was well to remember these things in comparing the cost. He considered the Kern better than the old "C" burner.

Mr. R. G. Shadbolt (Grantham), referring to comparisons of the old "C" bulb burner and the Kern for use in street-lamps,

said there was one point they had overlooked, and that was the old-fashioned reflector in use with the bulb burner. For some four winters now, they had lighted the central part of Grantham with incandescent burners. In the first instance, they experimented with the ordinary "C" burner with talc or mica chimneys; but they very soon adopted the bulb burner. He found, comparing their own lamps with those of the Railway Company (which were in close proximity to the "C" bulb lamps, and were fitted with two No. 4 Kern burners), that, although the light was very intense or brilliant at the centre of illumination, still the effect upon the ground did not seem to be as good. In fact, they were satisfied at Grantham that the "C" bulb burner was preferable to the Kern burner. Having related a little experience in which there was an excessive destruction of mantles outside a toy shop owing to the packing of empty crates round the column, he said he agreed with Mr. Jolliffe that efficient lighting could not be accomplished with less than six mantles per lamp per annum. In his own case, they used an average of 5 or 5½.

Mr. J. CARTER (Lincoln) could not quite see why the old rub against lamp columns had been indulged in, nor did he see any reason why they should be recommended to associate an expenditure of £8 or £12 for a lamp and column with the establishment of the system of incandescent street lighting. The more economical they could make the original adoption of the system, the more likely were they to succeed. During the last few months, he had been conducting an experiment with the Kern burner; and in some cases he purchased new lanterns for the purpose, and utilized the existing columns, because he recognized that the object he was seeking to attain was not to provide an attractive lamp pillar for those who walked along the street in the daytime, but to provide as effective a light as possible in the streets at night time. He was thinking more of the lighting than he was of gratifying any aesthetic or artistic taste. In two cases he bought new lanterns, and in about twenty cases he utilized the somewhat despised 14-inch lanterns, fitting them with opal tops and closing in the bottom part. The cost of this was about 2s. 6d. or 3s. The lamps were supplied with No. 4 Kern burners, with anti-vibrators; and after 1871 lighting-hours (with 23 or 24 lamps in use) only three new mantles had been required, and in the other 21 cases the original mantles were still in use—in fact, they had been burning for something like 2000 lighting-hours. Having explained the causes to which he ascribed the failure of the three mantles, he said that, after 1800 hours' burning, in one case he put on a new mantle for the purpose of observing whether the ordinary passer-by would be able to distinguish between the light given by those that had been burning 1800 hours and the new one; and a very careful examination would have to be made before anyone would discern any appreciable loss of light. He would like to know whether Mr. Sheldrake could tell them what was the pressure at which the Kern burner could be relied upon to give the utmost efficiency.

Mr. J. H. TROUGHTON (Newmarket) said, with reference to the new glass protector, Mr. Sheldrake in his paper compared the results secured when using this with those obtained by a naked burner. He thought it would have been much more satisfactory if he could have given them the same comparison with the glass that was sold as the latest improved bulb. In his table, Mr. Sheldrake showed that with this glass protector an increased lighting efficiency of something like 14 per cent. was obtained. Some eight months ago they adopted the incandescent system at Newmarket; and all the lamps were fitted up with Nos. 3 and 4 Kern burners. From experiments, he had found them a very great improvement over the "C" burner. In regard to gas consumption, the "C" burner used 4 cubic feet per hour; while the Kern burner consumed a little over that with the bye-pass. There was a good deal of waste with bye-passes if left to the lamplighters; and besides they blackened the mantles. He was rather sorry the author had not said anything about the matchless form of lighting lamps. If some such method could be invented for street lighting, it would be a great improvement. He also missed from the paper any reference to intensified gas-lighting.

The PRESIDENT, having acknowledged the indebtedness of the Association to Mr. Sheldrake for his paper, said that some twelve months ago his Company offered to light Sleaford with incandescent burners, if the authority would assure them of a three or fours years' contract. They did not want any guarantee. The authority could not see their way clear to give any assurance owing to an application by them to the Board of Trade for a Provisional Order to supply electricity. Notwithstanding, he advised his Board to light up the principal streets with the incandescent burner. They adopted his suggestion; and now they had the whole of the main streets lighted with Kern burners fitted in new lanterns. Although they used an anti-vibrator burner, and had protected the mantles in several ways, the average use of mantles was a little over six per annum.

Mr. SHELDRAKE, in replying, said that, with reference to Mr. Best's remarks, the paper dealt with street and not interior lighting. There was no doubt that the Welsbach or any other form of incandescent burner must be properly and constantly cleansed from all dust and dirt, which, of course, militated against its lighting power. As to Mr. Child's criticisms, the forks to which he (Mr. Sheldrake) referred in the paper were those sold outside the Welsbach Company. There were thousands of these bought from makers who did not take the trouble that the Welsbach Company did to see that they were sent out of the correct length. Mr. Jolliffe had alluded to the use of the bulb chimney with the "C" burner. There was no doubt that this form of chimney did protect the mantle; but he (Mr. Sheldrake) considered there was a great risk in using an enclosed chimney of this form, and a great loss of illuminating power unless they were kept very clean. They "bloomed" very quickly; and the consequence was there was a great loss of illuminating power. Comparisons had been made between the "C" and the Kern burner. The former collected the dust much quicker than the latter; and, in his opinion, one of the great advantages of the Kern burner was that there was no part on which the dust could accumulate, excepting in the cone, which took a long time to choke. A short time ago he saw some tests made with a dirty "C" burner, which only gave about 13 candles; but by cleaning it a light of 42 candles was obtained. This proved that the cleansing of the burner was an important point. As to the cost of mantles in Berlin, of course that was a subject on which he could not say much. In Berlin, there were no patent rights; and there were in England. [Mr. JOLLIFFE: That's a pity.] That might be so; but it was a consideration from which no doubt gas companies would reap benefit in the future. Mr. Brown had taken him severely to task in one respect, in saying that he (Mr. Sheldrake) had ridiculed the old lamp-posts. This was not so. The position he took up was that those who were putting down new lamp-posts should get the ironfounders to give them a better design than the old octagon and fluted patterns. He did not think for a moment that in England they would spend the same amount of money on the street-lamps that was done on the Continent; and he did not see that they could. They might, however, when opportunity arose, have something a little more tasteful. He agreed that if the ventilation of a 14-inch lantern was altered, it would do for a No. 2 Kern burner, but he should not recommend it for a No. 4. He did not think it was fair to the burner; and the top of the lamp was so open that any down-draught would be sure to affect the mantle in the long run. With regard to the average of 1½ mantles per lamp, that was a figure published in connection with one of the West of England towns. Personally he doubted it. An average of six a year was a very good result; but with the new protector, it might be brought down to about four. He did not think a ⅛-inch flame for the bye-pass would be sufficient, as the least draught in winter would blow it out; and he thought they ought to have a ⅜-inch flame. As to the distance apart of lamp-posts, they should be nearer in towns and cities than in outlying districts; but when they came to hear of lamps being 150 and 200 yards apart, it was certainly a distance that ought to be reduced. In some main thoroughfares, the lamps were only 25 yards apart; and his point was as to whether in such cases they might not be a little farther apart, and the outlying districts get the advantage. For the "C" burners, he thought a 9-inch chimney was longer than there was any necessity for; and a large number had been used only 6 inches long. The new glass was not a chimney; it was only a protector for the mantles on the new burners. The "C" bulb burner was no doubt the best of its class; but such good results could not be obtained with it as with the Kern burner. He congratulated Mr. Carter on the splendid results he had obtained; and, speaking of governors, he thought that the highest results were realized when the gas was at 1 inch pressure. He did not think Mr. Troughton had correctly read his figures as to the percentage increase in light of protected over unprotected mantles. They showed that with a bulb glass an increase of 2¼ per cent. was obtained over the naked mantle, and with the new form of glass 18 per cent. As to matchless gas lighting, they had a new method which was a great success. By turning a tap to the right, a bye-pass was lit; then by putting the lever or tap vertical, the burner was full on; and by turning it to the left, the flame could be extinguished or lowered. This device had been perfected for interior lighting; and before long he had no doubt they would have it adapted for street lighting. He could not say he was altogether in favour of intensified lighting. Splendid results were obtained—30 to 40 candles per cubic foot of gas—but with an expenditure not only of the gas, but of some form of energy, besides which there was the increased wear and tear of the mantles. In some experiments with a series of Kern burners, he had obtained about 104 candles per burner, and 240 candles when working at a pressure of about 8½ inches; but instead of only using 4 cubic feet of gas, he burnt 8½ feet, and energy had to be provided to furnish the increased pressure. Two No. 4 Kern burners would give equal satisfaction, without any trouble or any outside energy. Of course, in certain places a very brilliant light would be useful, no matter what the cost; but for street lighting, he did not look upon intensified lighting as having any chance for some time to come.

GAS COAL: ITS PRESENT PRICE AND EFFECT ON THE GAS INDUSTRY.

Mr. R. G. SHADBOLT (Grantham) opened a discussion on the above subject. After a few preliminary remarks, he said they could not talk about gas coal without taking into consideration the coal trade generally, for the gas industry used but a very small proportion of the total quantity raised in the United

Kingdom. If they took the total quantity raised last year as being 200 million tons, and the consumption of gas coal, according to the Board of Trade returns, as about 12 million tons, then they had the proportion that the consumption of coal in the gas industry bore to the whole. There was no mistaking from this that the present price was due not to the demand for gas coal, but to extraneous or outside circumstances, over which the gas industry had no control. The total exports of coal from the United Kingdom last year amounted to 41,180,300 tons, against 35,058,430 tons in 1898. Adding to this the coal shipped at ports in the United Kingdom for ships' use on foreign voyages, amounting to 12,226,801 tons, as against 11,264,204 tons in 1898, they had the increase in the coal (if he might put it so) used out of the country in 1899 over 1898. Of the increase of 6,121,870 tons in exports, 5,589,594 tons were sent to Europe—to France, South of Europe, North Russia, and so on. This accounted for the principal portion. Then adding the increased quantity used by British vessels on foreign voyages (962,597 tons), the total increased quantity used out of the country last year was 7,084,467 tons, or about 3½ per cent. of the total output of the country. Another way of looking at this, and realizing what it meant, was to see the proportion it bore to the coal used by the gas industry. He found that this quantity (the 7,084,467 tons) was a little more than one-half the total used by the authorized gas undertakings of the United Kingdom—in fact, it was about 7-12ths. In other words, as far as the export trade was concerned, about 7-12ths of the quantity used for gas making had been exported over and above the previous year. This must have some effect upon the present state of affairs as to the increased cost to the colliery proprietors. Yet he thought the members would all agree that 5s. or 7s. a ton, as the case might be, was altogether out of proportion to the extra cost the colliery proprietors had been put to. If they tried to look at the matter fairly and squarely, they might safely say that the advances of the last year or two had met the increased cost of production. Going further than that, and taking into account the increases to miners during last year, and the prospective increases, the increased cost of materials of every kind, and incidentals, they would be very liberal if they put the whole of this down at 1s. a ton. So that he thought, without being unfair in any way, they might safely conclude that they were about to be, if not actually being, taxed to the extent of about 4s. a ton for Yorkshire coal, and 6s. a ton for Durham coal. This unusual state of affairs was causing the responsible heads of gas undertakings a great deal of anxious consideration. No doubt it was all due to the flourishing home trade and to the exports as already shown. He thought he might make this as an assertion, that the demand for gas coal was perhaps of all demands for coal the most constant; so that the rise was not due to any fluctuation on the part of gas makers, or any increase or sudden great demand upon the collieries, but it was due to something more than they could control—in other words, they were subject to the fluctuations of others, and were suffering undoubtedly from causes not immediately their own. In considering the effects of this increase in prices upon the gas industry, the first question that presented itself to his mind was, was it likely to be permanent, or was it only of temporary duration? Upon this hinged the whole question. If it was likely to be permanent, then they had only one course before them, and that was to estimate to the full extent the effect it would have upon the cost of producing gas, and put it entirely upon the price of gas to the consumers, because, as had been said by the Chairman of the Cambridge Gas Company, the remuneration of gas shareholders and authorities was none too much as it was. His own idea, however, was that the rise was of a temporary rather than of a permanent nature—that it had almost, if not quite, reached its zenith; and that the long-suffering gas people had reached the limit of (should he call it) the coal tax. Mr. Bennett H. Brough, in an article in the "Nineteenth Century" for April, brought forward a new factor, which would have the tendency of preventing any further great increase in the price of coal generally. He said:

> There have been extraordinary demands principally from Austria, south of France, Belgium, and Russia. In short, throughout Europe there is the same story of the scarcity of coal. "Ill blows the wind that profits nobody." Europe's difficulty appears to be America's opportunity; and if the high prices are maintained, large deliveries may be expected from the United States. Atlantic liners no longer carry coal from Great Britain for the return journey; they take in American coal. In February, the Paris, Lyons, and Mediterranean Railway ordered 75,000 tons of American coal, and 50,000 tons were shipped from Philadelphia to Italy for railway use at a cost of 6s. per ton f.o.b. Indeed, it is possible that American exports of coal may in time become as important as those of wheat and cotton; for whilst in Europe the price of coal has of late years constantly increased, in the United States it has shown a tendency to decline. One of the chief causes of the lower prices obtaining in America is the general use of mining machines, which enables the coalowners to produce their coal with less men; the output per miner being increased 50 to 100 per cent. A lesson in keeping down costs might certainly be learned from the United States.

He (Mr. Shadbolt) thought there was a factor here, which, if coal prices went much further, would at any rate affect the exports to our European markets. The question was, What would it cost to get American coal here? Mr. Standring had very kindly assisted him in this matter; and he had given him as the probable freight for coal from New Orleans to Liverpool 18s. per ton, and from New York rather less; so that if they took the 18s., *plus* 6s. f.o.b., they had the cost as 24s. at British ports. A Russian order was recently placed for 200,000 tons of South Wales coal; and, adding to the 24s. the extra freight for the additional distance for American steam coal to (say) Odessa, one would think that American coal ought to be within reasonable distance of competing in an instance of that kind, where it was being delivered at 31s. The 24s. and 31s. left a good margin between the rates at Liverpool and Odessa. So it seemed to him they were within measurable distance of a new factor. They might depend upon it that, if the European markets were tapped by America, freights might easily fall, and exports from which they, as gas manufacturers, were now suffering, would decrease in consequence. This in itself might in time effect some cure. He (Mr. Shadbolt) therefore took up the position that it looked as though they had reached almost, if not quite, the maximum price. Then there was the question whether this was likely to be permanent or not. He thought they must take the present price as to some extent a forced one. What he meant was that the cost of production did not warrant it—it was the state of the market simply; and as soon as the tension was relieved, from whatever source, the price was bound to fall accordingly. It might be that to some extent the present prices had been decided upon as a set-off against the low prices which ruled a few years ago, and upon which, unfortunately, their gas prices were based. Like water, in course of time this would all find its own level; and eventually they might reach the happy mean. Until then, however, they must keep moving. They had the position to face; and the question was, what were they to do *now?* In seeking for compensating features, they naturally looked almost wholly and solely to residuals. With fuels all round advancing, coke must benefit; and the coke return ought to be improved. To the extent that the residuals were enhanced in value, they would reduce the extra burden. Comparing the prices of residuals with twelve months ago, they might take it, speaking generally, that tar was worth 5s. per ton more, liquor 1s. 6d., and coke 5s. As to whether these advances would outstand the coal advances was a vital question, and subject to many and diverse influences, local and general. They might assume, for the sake of argument, that they would stand good over the next coal contracts. Then if they allowed an output, speaking generally again, of 8 cwt. of coke per ton of coal carbonized, 3 cwt. of 5° Twaddel ammoniacal liquor, and 1 cwt. of tar, they got from coke an increased yield of 2s., from liquor 2·7d., and from tar 3d., making a total of 2s. 5·7d. to set against the increased price of coal. This left a balance of 2s. 6·3d. per ton in the case of Yorkshire coal, and 4s. 6·3d. with Durham coal. If they allowed 9000 cubic feet of gas sold per ton of coal carbonized, they found these balances equalled 3·36d. per 1000 cubic feet of gas from Yorkshire coal and 6·03d. per 1000 feet from Durham coal. Other materials had also advanced; and as Durham coal yielded perhaps more coke than Yorkshire, they might safely add 4d. increase per 1000 feet of gas where Yorkshire coal was used, and 6d. where Durham coal was used. This, of course, was irrespective of sliding-scales and reserve funds, or anything of that kind, and was simply what was necessary to maintain last year's position. Another question followed, and that was, How was this advance in the price of gas going to affect them as an industry? Would it have the tendency of curtailing consumption, or fostering it? Increases in price had not the tendency of fostering consumption as a rule; but it might in this case prove (should he call it) "a blessing in disguise"—at any rate, the cloud might have a silver lining. For, if they took into account the return they might probably expect from residuals, and thereby reduce their burden to some extent, they found, comparing gas with other methods of obtaining light, heat, and power, the increase they had to bear was much less than would have to be borne by the others. Thus the residuals were their salvation; there were no residuals from any of the other sources of light, heat, and power. As he had shown, however, gas manufacturers were unable to meet the entire increase, and they were compelled to put it upon the price of their own commodity, but not in the same proportion as others. In this was their opportunity. Then, again, the ordinary renewals and repairs of gas-works took place very irregularly; and if they could persuade themselves that the present advance in price was only temporary, it behoved them to retrench to some extent so far as renewals and replacements of plant were concerned. If they could shelve schemes of this kind for a year or two, until the price of coal fell to something more reasonable, they would be able to tide over and to benefit thereby. And if they could prove to the public that they had been compelled to advance their prices less than any other means of obtaining light, heat, and fuel, they would again benefit very considerably, more customers would be gained, and they would extend the use of gas for cooking and heating purposes; and this time next year gas stock would probably be more valuable than it was to-day. Speaking of coke, he thought it had been apparent to all of them at different times that gas-works were given very much to over-lapping and under-selling. Coke was the principal residual in the present crisis to which they looked for some return and assistance. In this Association they had a membership representing about 58 different gas-works, 36 of which were under 50 millions in their annual make. It ought not, in a district of this character, to be without the range of possibility to prevent at any rate a great deal of this overlapping and underselling, and so enhance the value of the residual which, at the

present time, was the factor they most relied on. There were large works at which the output of coke was out of all proportion to the local requirements; and consequently the towns immediately adjoining must suffer. He thought that, in a district like the Eastern Counties, the members of the Association might arrange something which, if it would not altogether remove the evil, would at any rate mitigate it.

Mr. J. CARTER (Lincoln) thought that probably the root of the whole trouble was the question of the exportation of coal. He sometimes felt that, if he had the power, he would deal with it in a very summary way, seeing how important were our coal resources, and how necessary they were to our industrial existence. It had sometimes occurred to him that the time might now have come in the history of the country when Parliament should take steps to retain the coal for home consumption. Respecting gas coal, a minimum increase of 5s. per ton had been talked about; and he presumed this would be the unfortunate experience of most of them. Mr. Shadbolt pointed out that the blow would be mitigated somewhat by residuals. But when they bore in mind that for the last six months they had had the advantage of higher prices for residuals, it seemed to him there was no possibility of expecting, in the next twelve months, an increased return of 5s. per ton upon saleable coke. Honesty and candour compelled the admission that there was no doubt they had been buying their coal at a price that neither paid the colliery owner for the risk of his capital and for the exercise of his brains, nor the collier for the danger and labour he had to undergo. But the mischief was their friends had placed them in the unfortunate position of having their gas prices based upon the low cost of coal. He was inclined to think that the increased cost of fuel would not have so great an effect in increasing the price of electricity as it would have upon the cost of gas.

Mr. P. W. D. STANDRING, on the invitation of the President, said the whole question simply resolved itself into one of demand and supply. For the last few years the demand for coal (more especially from foreign nations) had been gradually increasing until it was ahead of the supply. He should like to know whether, in his comparisons, Mr. Shadbolt took into account the Welsh strike.

Mr. SHADBOLT said he had taken nothing but what appeared in the returns.

Mr. STANDRING said the exports were largely diminished in 1898, and this made 1899 look much larger. With Mr. Shadbolt, he should not be at all surprised if they did not see American coal in this country before many years, especially if the price of British coal increased much more. He believed they had an excellent gas coal in America; but how far it was from the coast, he could not say. With regard to the future, he thought the present prices would continue for some time, if they did not still further increase. The wages of the colliers compared with twelve years ago had increased 45 per cent.; and there was every likelihood that they would increase again next year, and then they would work still less. Every colliery was now suffering from a largely decreased output; and he did not think there were any owners of gas coal who would this year want to sell as much as they did last year, simply because they had not got it. As to putting a tax upon exported coal, he thought it would be a good thing for the country; and he did not think the coal owners would object so long as Government made up the profits they lost. (Laughter.)

Mr. C. W. GRIMWOOD (Sudbury) remarked that the rise in the price of coal had placed all gas-works in a disastrous position. But his situation was worse than any of the members present, as, being the lessee of a gas-works, he had no one to fall back upon, and had to bear the whole burden himself. There was no help for it; and all they could hope was that circumstances would alter very soon, with a return to former prices.

Mr. WORTHINGTON CHURCH observed that to a large extent the present prices were due to the Continental demand. He did not quite like the word "false" that Mr. Shadbolt used; and he did not think present prices were fictitious, considering the positions in which the colliery owners were located. There was very great trouble with regard to labour. Labour, as Mr. Standring had stated, had increased by 45 per cent.; and the price of timber had gone up by about the same amount during the last two or three years. Then, again, in regard to the shortage of coal, it must be remembered that the output was restricted to a large extent this last winter, because the railway companies were unable to deal with the traffic. One of the Midland managers told him that they had 800 men suffering from influenza and other complaints during the winter; and the fact was they could not possibly deal with the enormous traffic over their lines. To this cause was due the short output of the collieries. The waggons could not get back in anything like time; and at one or two of the collieries in Yorkshire, they had to stop two or three days in a week waiting for supplies of waggons. He was much obliged to Mr. Carter for what he had said when referring to colliery proprietors. He (Mr. Church) was interested as a shareholder in a colliery in Yorkshire, and up to last year they had not had a dividend for four years. He was also a second debenture holder in another colliery, and had not yet been paid a single farthing on his holding. Under the circumstances, the colliery proprietors ought not to be blamed, because many of them had been working at a great loss; and, as far as he was personally concerned, he should be only too pleased to see the prices of coal fall to their normal level.

Mr. C. G. GRIMWOOD (Sudbury) said this question of price bore heavily on small works. Mr. Shadbolt's figure of 8 cwt. of coke per ton of coal carbonized was not what they got in village works. If they obtained an average of 2 or 3 cwt. on a year's working, they were very fortunate. Then with regard to the increased prices for liquor, in a village works, if they did not know where the liquor went to they were very thankful.

Mr. T. CASH (Birmingham) said he was much struck by the remarks made by Mr. Carter when he referred most pointedly to the keen competition that took place some years ago. He remembered some years since going to a very large town in Lancashire to see the Chairman and Engineer of the gas undertaking. He saw them; and the Chairman suggested that he was in a position to give an order for 15,000 tons of coal provided he (Mr. Cash) would take 3d. per ton off. That 3d. was just the profit. But his firm, being burdened with a heavy rolling-stock, he took the order at absolutely cost price, to keep the wheels running. In his own town, it was the custom for a good many years for the Chairman of the Gas Committee to send round to the colliery people to notify them of the tendered prices; and for a good many years, it would be in the recollection of the people who were connected with collieries that at Birmingham they pitted one district against another. They would not buy from North Wales or North Staffordshire one year; and they would miss Derbyshire out altogether the next. Such actions as these had brought about, in great measure, the present state of things. With respect to combination, there was no doubt that, having lost very heavily, the colliery proprietors were forced to consider whether they could not combine with a view to getting better prices. This was the beginning of the whole question; and added to this, they had the largely increased demand, and the very largely increased export. The clauses put in many of the tender forms would also now have to be considerably altered. In the office he represented, they had perhaps half-a-dozen tender forms in which the engineer had the option of increasing the contract quantity by 10 per cent. or reducing it by 10 per cent. The result of this was that, when the demand was weak, the engineer would not take so much by 10 per cent., but when it was strong, he would call upon the colliery proprietors for 10 per cent. extra. Under the new combination, the colliery proprietors had come to the conclusion that it would be a wise thing to do away with any clause of this kind. There was no doubt that the increased demand for coal on the Continent had largely brought about the present state of things.

Mr. E. W. SMITH (Chelmsford) said they had heard Mr. Shadbolt and the views of three gentlemen connected with the coal trade; and he was not sure that their views quite accounted for the 5s. or 7s. per ton balance. They were told the extra cost of labour and timber had a good deal to do with the advance in price; but they did not hear quite so much about this until the middle of the past winter. They had been informed that the cost of labour had been going up during the last two years; so that they might conclude it had not gone up with a rush in the middle of the winter of 1899. It seemed to him the increase in price was more to be accounted for by a desire on the part of the colliery proprietors to protect themselves against difficulties in keeping up their winter supplies. He believed that if those managers who were in a position to do so would lay in large stocks of coal during the summer months, and thereby even-up the delivery as much as possible, they would relieve the colliery proprietors, and there would not be so much desire on their part to raise the prices and so protect themselves during the heavy winter months.

Mr. BEST agreed with the last speaker that it was a wise policy to have large coal storage, as, with a good stock on hand, they could afford to wait in times of difficulty.

The PRESIDENT thought the best policy would be for gas undertakings to combine in the different districts in order to get the highest possible price for coke. His impression was that this was their stronghold; and if they could combine so as not to overlap, so much the better. When situated within half-hour's run of a large town that had considerable quantities of coke to dispose of, the manager of a small works felt the competition very keenly.

Mr. SHADBOLT, in reply, said Mr. Carter had spoken of protection. Certainly one effect of this would be to keep the coal in the country, and no doubt the country at large would benefit directly; but whether it would benefit all round, and eventually, was a moot question. When they spoke of Great Britain to-day, patriotic Englishmen included the Colonies; and he believed there were untold areas of coal-fields in America and in the Colonies to which, when the home resources came to be exhausted, they would no doubt turn, although, of course, the price must of necessity be greater. He did not quite follow Mr. Carter in his remarks about coke; but he (Mr. Shadbolt) adhered to the statement that their coke prices generally were 5s. per ton better than they were twelve months ago. Of course, it would be understood that in his opening he only tried to lay down a basis on general lines. Mr. Standring had referred to the colliers' wages, and said they would want more. Well, he (Mr. Shadbolt) had shown there was at least 4s. per ton to go on with. If coal prices were to be advanced 4s. or 5s. more, the sooner the gas industry got control of the collieries, the better. (Laughter). Mr. Standring had also remarked that, if the colliers were paid better, they would work less; but it was a peculiar comment on the present question, that last year's output

per man was higher than it was the previous year. As to Mr. Church's remarks, he did not use the word "false;" "forced" was the expression he employed. What he meant was that the present position had been forced upon them; and he saw no sufficient justification for it. Mr. Church hoped the time was not far distant when prices would fall to their normal level; so that even their coal friends admitted they were abnormal at the present time. He sympathized very much with managers of small works, as this question must be a serious one indeed for them. Mr. Cash had spoken of combinations being formed with respect to the selling of coal. Then the gas industry would have to combine with the object of buying it. The present were abnormal prices, which were bound to come down sooner or later; and perhaps only artificial circumstances were holding them up.

A hearty vote of thanks was passed to both Mr. Sheldrake and Mr. Shadbolt for their contributions to the proceedings.

ELECTION OF NEW OFFICERS.

On the proposition of the PRESIDENT, seconded by Mr. J. BECK (Stamford), Mr. J. G. Hawkins was unanimously elected President for the ensuing year.

Mr. HAWKINS acknowledged the honour the members had conferred upon him, and assured them that he would use his best endeavours to fulfil the duties of the post to their satisfaction.

On the proposition of Mr. CHILD, seconded by the HON. SECRETARY, Mr. R. Brown was elected to succeed Mr. Hawkins in the vice-presidency.

Mr. BROWN also suitably thanked the members.

Other resolutions were passed re-appointing the Hon. Secretary (Mr. Troughton) and the Auditors (Messrs. Panchen and Ellis), and electing Mr. Frank Clark (Southend) and Mr. R. G. Shadbolt members of the Committee for two years. Mr. E. W. Smith also consented to continue on the Committee for another year in place of Mr. Brown.

VOTES OF THANKS.

Mr. JOLLIFFE moved a vote of thanks to the retiring President for his services during the past year, and referred to the deep indebtedness of the members to Mr. Wimhurst for his work since the inception of the Association.

Mr. CHILD seconded the motion, which was acknowledged in meet terms by the PRESIDENT.

Mr. R. J. SHARMAN (Wisbech) next proposed, and Mr. C. G. GRIMWOOD (Sudbury) seconded, a vote of thanks to the several officers; and this was also cordially passed.

THE AUTUMN MEETING.

On the invitation of the PRESIDENT-ELECT, the members decided to visit Spalding for the autumn meeting.

This concluded the business on the *agenda;* and afterwards the members dined together.

OHIO GASLIGHT ASSOCIATION.

The Sixteenth Annual Meeting of the Association was held at Columbus (Ohio), on the 21st and 22nd ult.—Mr. A. P. LATHROP, the President, in the chair. The preliminary business included the election of 35 members; bringing the total membership up to 240.

The President delivered an Inaugural Address in which he referred to the large increase of business done by most of the gas companies in the State—an increase that was due, not only to good trade generally, but also to better appreciation of the comforts and economies resulting from the use of gas. The net earnings, however, had not materially risen, because of the enormous increase in cost of nearly every article entering into the manufacture of gas. There was no prospect of relief in the immediate future, but, on the contrary, every probability of further advance in the price of coal, oil, &c. Although residuals were somewhat better than a year ago, the increased returns thus obtainable would in no way make up for the advance in the cost of raw material. There was only one direction in which to look, in order to maintain profits; and that was the further growth of business, which must be met at a minimum cost. Great efforts should be made to get gas into buildings situate on the lines of main, but not at present piped for gas. Street lighting by gas was again coming into favour; there was the prepayment meter; and there was also the continually increasing demand for gas-stoves. Many companies in the State had been affected by the competition of natural gas; but it could only be a question of time when the supply would be exhausted. In the coke-oven process as introduced at Boston, there was a prospect of a substitute for natural gas. In dealing with municipal ownership, he referred to the case of a municipality who had acquired an electric light undertaking, and then tried to get the local gas-works shut up as a nuisance and a danger to health. An offer had been made in good faith to the League of American Municipalities, to investigate the accounts of any twenty electric plants to be selected by the President, with a view of comparing the cost with that of electricity supplied by companies. He contended that municipal ownership had not been, and was not, a success; and he challenged anyone to give a single instance of a municipal plant that had cost no more than was anticipated, and yielded all that was promised. It was only after considerable effort that the League was induced to accept this proposition; and then they only did so on condition of being able to raise the necessary funds. So far as he knew, they were making no effort in this direction. He recommended the Association to take the question up, and appoint a Committee to assist in raising a fund for such a purpose. He would himself promise a £20 donation. The roll of the Association was increasing; but still there were many gas companies in the district who did not appreciate the advantages of membership, and he moved the appointment of a Committee on Membership, to make earnest efforts to obtain new members.

Mr. F. E. Persons, of Toledo (Ohio), read a paper entitled "Gas-Appliance Exchanges;" advocating the establishment of exchanges in every gas district, for the sale of all kinds of gas stores and apparatus, to be conducted as an independent venture, but under the patronage and co-operation of the local gas company. The gas-works manager had so many duties that the sales department was at times side-tracked, if not absolutely neglected; and the hardware trade was only of use if sufficiently subsidized to feel that there was more profit in selling gas apparatus than appliances for gasoline, wood, or coals. He argued that a customer who bought a gas-stove at a fair moderate price took more interest in it and in the use of gas than one who was supplied *gratis;* and he enlarged on the importance at the present time of increasing the number of consumers and the output of stoves.

The President having invited discussion, Mr. Olds said he had recently introduced the plan of selling stoves at cost price on the instalment system, and doing the fixing free. He had met with a fair amount of success. He was told that at Springfield (Ill.) a purchaser of £6 10s. worth of gas received a stove *gratis*. General Hickenlooper was quite in favour of the gas-appliance exchange. It was all very well to incur some initial expense in introducing new lines of business; but he did not believe in a permanent policy of stoves *gratis*, and thought the main thing was to sell gas at the lowest possible price. An exchange was, in fact, introduced in Cincinnati many years ago, with the aid of a lady instructress and canvasser, who assisted ladies in the economical and efficient use of gas-stoves. From this small beginning, the thing had spread, till he could safely say that at present 90 per cent. of his customers used gas-stoves. For many years, he was accustomed to fix gas-stoves free, whether purchased through his Company or at a hardware shop. He had, however, discontinued this practice, partly on the representation of the Gas-Fitters' Association of the city—a body whom it was not desirable to offend—and also because, having reduced his price for gas to 2s. per 1000 cubic feet for fuel purposes, he could not possibly offer a bonus in any shape or form in addition to this low price. Mr. Madison had been successful, at Madison (Wis.), in the introduction of gas-stoves. He advertised and pushed the business actively; having a house-to-house canvass, and keeping a record that was revised each year. The city, which comprised 18,000 inhabitants, was divided into four districts; and he kept four men busy for 7½ months of the year. By systematic effort, personal solicitation, and plenty of advertising, it was possible to secure excellent results. Mr. F. W. Stone offered no special inducement beyond a rebate of 20 per cent. in gas on the value of a gas-stove purchased. Thus, if a stove cost £5, he gave £1 worth of free gas. Otherwise he relied on annual canvassing, personal solicitation, and advertising, and endeavoured to avoid antagonizing the hardware dealers or plumbers of the town. He felt the great need at present was a good scheme for educating consumers in the use and advantages of the gas-stove. Mr. E. B. Philipp, as representing a small town, recommended buying cheap stoves and retailing at a nominal price, as a means of increasing consumption. Mr. C. R. Faben, jun., remarked that the ideas of the practical manager were not always in accord with those held at the moneyed end of the Company; and therefore he was not always in a position to put them into practice. Many gas companies looked at the first cost of the stoves, without regard to their money-earning power. It was all very well to put in a few stoves each year at the cost of revenue; but this was not making the most of the opportunity, and he advocated looking at the thing as an investment in itself. Electric light companies did not stand back when a man had not money to wire his house; he did not have to forego the advantages of electricity because of that fact. And they did better than gas companies, which were run on hard-and-fast ideas of treating all alike. He did not advocate free stoves; but if it paid to let meters on hire, it was certainly wise to supply stoves on similar terms, as a means of increasing the average consumption of gas per consumer. Indeed, the capital invested in stoves was more remunerative than that laid out for mains in sparsely occupied districts. Mr. H. L. Doherty believed fully in devoting the best energies to the sale of gas; but he reminded the meeting that the putting out of stoves was only a means to an end, and it was more important to see that the stoves already out were in regular use than to push on the additional ones. Whether they gave away, fixed *gratis*, canvassed, or advertised, they must see that every stove gave satisfaction. Each complaint, well grounded or otherwise, must be satisfied. If five persons said the gas-stove is good, and a sixth added "Yes, but costly," the chances were that his opinion would carry most weight. With gas at 5s., and careful attention, it was possible to get better results than gas at 3s. 4d., and indifference. Much energy

was wasted in unintelligent effort. At Madison, with a population of 18,000, there were 1550 gas-stoves fixed. He firmly believed the cost of the stoves was not the only drawback. People either did not know about them, or were prejudiced against them. Therefore he advocated free cookery demonstrations, and free instruction in the board-schools and at consumers' houses. Let everyone in the city see and know about the working of a gas-stove. Advertising was good; but sometimes there were so many publications in a city that it was a heavy tax to advertise in all. He suggested the formation of a National Advertising Bureau, to arrange advertisements in the leading monthly magazines of the country. This would secure better results than merely advertising in the local newspaper. He did not discountenance the latter, but was sure that by means of a Bureau excellent results would follow a comparatively small outlay; and he would move at a later period of the meeting that a Committee be formed to take up the matter in conjunction with other Associations. Mr. J. D. M'Ilhenny related his experiences in a town of 30,000 inhabitants, where the sale of gas had not heretofore been pushed in any way. He made a complete canvass, taking full record of each house in the district, and offered to sell stoves right out at bare cost, or on the instalment plan, so that customers could try the stove for three months before purchasing. He preferred to sell at cost price, as being more business-like, rather than give away or sell at a nominal charge; and he would rather spend money in advertising or canvassing than in paying part of the cost of the stoves. But every company should be governed by local circumstances; and the policy to follow was the one that paid the best. It was not much use, for instance, to give away stoves in a district where the chief objection to their use was the cost of the gas. Mr. Persons said that by means of combined action among neighbouring gas companies, a considerable saving could be effected in the matter of travelling expenses of cooking demonstrators who went from one town to another. Mr. Doherty explained that his scheme was intended as an addition to local advertising, and in no sense as a substitute for it. He was not in favour of discontinuing local advertising.

(To be continued.)

LAYING PIPES UNDER WATER.

In a recent number of "Engineering News," particulars were given of the work of laying a 36-inch water-main across the Harlem River, lately completed by the Municipality of New York, for the better supply of water to the long strip of territory lying between the Hudson and the above-named river. The line is chiefly remarkable for the excessive weight of the jointed pipe used. At the point crossed, the Harlem is 1200 feet wide; and, to meet future demands from commerce in this improved waterway, it was necessary to dredge a trench across the river to a depth of 30 feet below mean low water. As there is a strong tidal current in the stream, since its recent improvement by the Government, this trench gave considerable trouble; and constant dredging was required to remove the silt brought into it by the action of the current.

The flexible-joint pipe used was 36 inches inside diameter, and was made to lay in 12-feet lengths, with a bell-and-spigot joint at the two ends. The bell was 5 feet in outside diameter at the extreme end, and was there reinforced by shrinking upon it an iron band, 6 inches wide and 2¼ inches thick; the bell was about 30 inches long. The spigot end was provided with two cast bands, 5 inches wide, and rounded to fit the spherical interior of the bell. The dovetailed space between these bands was 6 inches wide by ¾ inch deep; and into this space was poured the lead which completed the flexible joint. Each of the joints required 1100 lbs. of lead. Each pipe length as delivered was 13 ft. 1 in. long, 36 inches interior diameter, and 40 inches exterior diameter in the body of the pipe. The wrought-iron band referred to weighed 663 lbs., and the cast-iron pipe 13,725 lbs.; or 14,388 lbs. for the pipe length complete.

The work of laying the 1200 feet of jointed pipe was begun in June, 1899, and completed on Dec. 6, 1899, by the Contractor for this portion of the work. The method adopted by him for laying the flexible pipe was as follows: A strong float, 97 feet long and 35 feet wide, was provided with a steam derrick for handling the pipe sections; blocking for holding about five pipe lengths at one time on the float; a launching way at one end of the float, &c. After the pipe had left one bank of the river, strong steel cables were securely attached to it; and by means of these cables the float was handled and the pipe was launched, section by section. Four precautionary anchors were used to guard against damage to the float from passing vessels. But as each joint was completed, the steel cables were cautiously slackened, and the weight of the pipe practically pushed the float towards the far shore as one pipe length after another slipped into the water. The cables were then again made fast, and another length was lifted, put in place, and attached, by pouring its joint, to the four lengths still remaining on the float. A repetition of this process, as pipe after pipe was added, finally resulted in the successful completion of the line across the river. The work required extreme care, and great experience and judgment in handling the cables; and the Contractor remained upon the float day and night throughout the operation.

REGISTER OF PATENTS.

Coin-Freed Gas-Meters.—Wright, J. F. & G. E., and Sutherland, A. G., of Birmingham. No. 6090; March 21, 1899.

One arrangement of this coin-freed meter—of the so-called "quiescent type"—is shown in the engraving. Fig. 1 is an elevation and fig. 2 a plan of the mechanism. Fig. 3 is a section on the line C D of fig. 1, with the coin-holder moved forward till the coin makes contact with the pin N (referred to later on).

The frame of the meter supports a rotatable shaft B, on which is fixed radially a coin-holder or pocket E. A plate F, mounted loosely on the shaft B, carries a driving-pawl G pivoted to the back of the plate. This pawl gears with a ratchet-wheel I fixed to a shaft K, which works the screw, nut, or other device supplying the gas in a quiescent or other type of meter. Fixed to the pawl G is a block L, against which the coin rubs as it is moved forward in the coin-holder in the direction of the arrow. When the coin has passed the block, it falls a little further out of the holder; so that if an attempt be made to move it back, it will engage with the face M of the block. The plate F also carries a pin N, which is engaged by the coin in its forward rotation. The plate will then be rotated, and with it the ratchet-wheel I and the shaft K, by means of the driving-pawl G. The coin cannot fall out of the holder till it reaches the end of the shield O, when it drops into a suitable receptacle—the holder being restrained from further motion by a stop. A disc R is fixed to the coin-holder or to the shaft B, so as to rotate with the holder. This disc is provided with notches on its periphery; and an arm T, furnished with a claw, and pivoted on the shaft B, engages with one or other of the notches. On the backward rotation of the holder (which must take place before another coin is inserted), a projection on the arm strikes the pin N on the plate F, and travels the plate backwards—the driving-pawl G slipping over the teeth of the ratchet-wheel I, held by a retaining pawl.

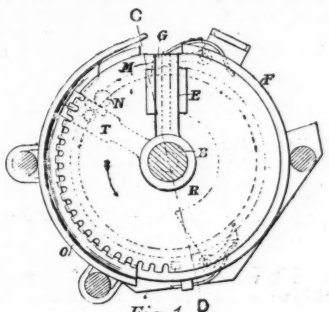


Fig. 1.

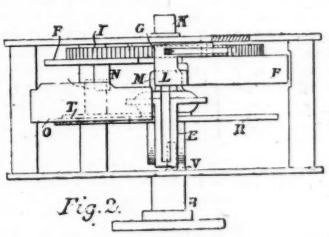


Fig. 2.

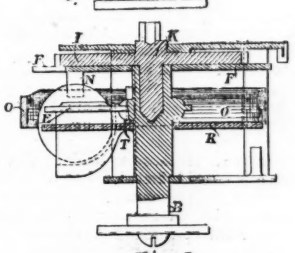


Fig. 3.

The amount of rotation of the shaft K (and therefore the quantity of gas supplied for each coin) can be varied by adjusting the position of the arm T relatively to the disc R, while adjustment can be easily effected, as the arm T is made of sufficiently thin material to spring clear of the disc as required. The notches are numbered in order to show the required delivery of gas.

On an attempt being made to move the coin backwards and forwards when in the holder, so as to produce a greater rotation of the shaft K, the coin catches on the face M of the block L, and presses the pawl G on the teeth of the ratchet-wheel I, which, being held by the retaining pawl, effectually stops the backward motion. The holder is stopped at the right place for the insertion of another coin by a pin V (fig. 2) fixed to the frame. When the holder is in the proper position for the insertion of a coin, the block L may be in front of it; and, to enable it to pass the block, the plate F is made flush with the block L to the right of the block, although it is not flush to the left. This is shown in fig. 2.

In a second modification of the invention, the backward movement of the coin is prevented by its engagement as a pawl in a ratchet sector. The coin can move forward by slipping over the teeth; and, when it passes the last tooth, it falls out of the holder. In this modification, the amount of rotation of the shaft is varied by altering the position of the ratchet-sector, so that the coin falls out sooner or later. The projection on the radial arm engages in notches in the fixed frame.

In a third modification, the coin is carried in a radial oscillating lever, oscillated from a suitable spindle, and connected to it by a link. The

oscillating coin-arm carries a pocket for the coins; and each coin, when dropped into the pocket, rests upon a toothed ratchet, which permits the lever to be moved forward, but prevents it being moved back by the engagement of the coin. The coin also, when inserted, engages a projecting pin passing into the coin-pocket, and projecting from a horizontal slide. The slide gears into a ratchet-wheel, which is prevented from returning by a spring pawl. The movement of the hand-wheel causes the oscillating arm to carry the penny beyond the end of the projecting fixed rack; and it then falls into the receptacle prepared for it. On the return stroke, however, a stop, adjustably mounted on a projection from the penny pocket, engages the other side of the stop projecting from the straight slide, which is then moved back ready to be operated again when another penny falls in. The amount of the backward motion depends upon the position of the adjustable stop. If the stop is placed well out, then the backward movement shifts the slide but little; while if the stop be close to the penny-pocket, then the slide is moved back an amount almost equal to the stroke of the penny radial arm. By adjusting the stop, the amount of gas to be given for each penny is regulated—that is, the adjustment of the stop determines the arc through which the ratchet-wheel shall be turned by the forward movement of the penny, and therefore the amount of gas given by the meter. The slide-ratchet operating above the ratchet-wheel is pressed downwards by a spring; so that on the forward stroke the ratchet-teeth engage the ratchet-wheel teeth, while on the backward stroke the straight slide slips over the teeth. By this device, it is possible to operate by simple mechanism a straight slide for the purpose of adjusting the gas supplied for a penny.

In a fourth modification, the use of the radial arm is dispensed with, and a push-in knob used instead. The push-rod carries at its end a penny-pocket; and the penny engages with a projection from a straight slide (as described in the last modification), and rests upon a rack formed of a screw-threaded nut. This nut screws on a projecting pin; and its position may be altered by screwing it out and in along the fixed screw-pin. Projections from the end of the screw-rod are supplied, which prevent the push-rod from being moved further than a specified distance. In this case, the adjustment is made by screwing in or out the nut-rack, which thus serves the double purpose of limiting the length of stroke of the push-rod, and preventing the rod being pulled back when the penny is placed in position. By this arrangement, oscillating movements and radial levers are dispensed with entirely.

Incandescence Bodies.—Duncan, J. H. H., of Coleman Street, the New Incandescent (Sunlight Patent) Gas Lighting Company, Limited, of Shoe Lane, E.C., and Barnett, H. T., of Teddington. No. 6919; March 30, 1899.

This invention, having reference to incandescence bodies for use as light-giving media in non-luminous flames, has for objects, *inter alia*, "to improve the colour of the light obtained with such bodies, to produce incandescence bodies having various light-giving properties without departing from the more satisfactory proportionate combinations of refractory substances ordinarily used in producing incandescence bodies, to obtain incandescence bodies varying within certain limits as to the colour or tint of light resulting from their use, and in some cases to give additional strength, durability, and coherence to the incandescence bodies." According to this invention, "variously tinted light-emitting bodies are united or combined mechanically in one composite body, in such a manner that the selectively emitted varying colours or tints of light combine to produce an effect more pleasing to the eye, or better suited to the purpose in view than heretofore." To this end, the patentees propose to "spin, double (*i.e.*, twist), knit, plait, cable, interweave, overweave, or otherwise mechanically connect, or associate separate filaments, threads, cords, rods, or other shaped bodies containing or consisting of different incandescence oxides which yield lights of differing colour or tint, into one composite structure."

Incandescence mantles for use with gas-flames can be made according to this invention in various ways. The following are given as examples of mantles affording "a golden white light."

(1) Two lengths of cotton thread are soaked, each in different solutions—one solution being such as to yield an incandescence body giving a light of greenish tint, for example, the mixture of about 99 per cent. of thoria and 1 per cent. of ceria, and the other solution being such as yields an incandescence body containing 50 per cent. of thoria, 40 per cent. of alumina, and 10 per cent. of chromic oxide. The soaked threads are dried and knitted, or otherwise intertwisted to form a mantle. The two threads may be knitted in such a manner that the mantle is composed of alternate rows of thoria-ceria and thoria-aluminachrome threads, or two or more rows of either kind of thread may be used to one of the other. Another mode of making such mantles is to knit the fabric into a continuous length composed of alternately-arranged short sections of the different kinds of thread, so that mantle lengths may be cut therefrom whose upper and lower portions are of different constitution. Mantles made by a weaving process may have the different kinds of threads equally distributed in the fabric, or one kind of thread may be chiefly at the inner surface of the mantle while the other kind is on the exterior surface of the mantle.

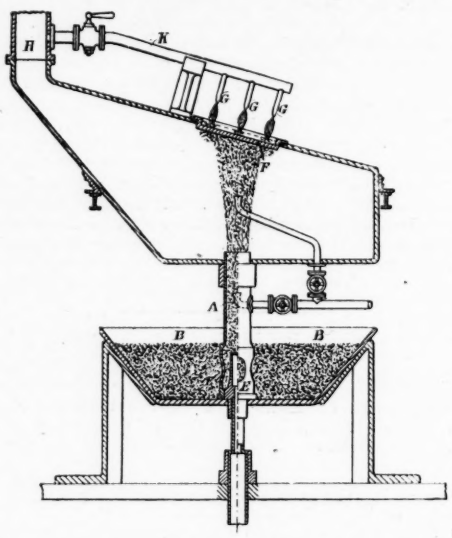
(2) Filaments containing two different mixtures of incandescence oxides are separately produced by the Knofler or some similar process, and the two kinds of filaments being doubled (*i.e.*, twisted) together to form a composite thread, which is made into mantles in the usual way. One kind of filament may contain thoria and ceria in or about the usual proportions, and the other kind alumina, chromic oxide, and zirconia or thoria—a satisfactory prescription for the latter being 35 per cent., chromic oxide 5 per cent., and alumina 60 per cent.; the alumina and thoria being conveniently added to the Knofler collodion in the form of nitrates of aluminium and thorium, and the chromic oxide as chromic acid, and the two kinds of filaments being used in the proportion of twelve thoria-ceria filaments to three of the other kind.

Incandescence mantles made according to the above examples are said to give "a light of golden white colour, which does not become green in tint, even when the mantles are well worn."

Continuous Generation of Water Gas.—Clauss, F., of Meerane, Saxony. No. 8239; April 19, 1899.

According to this invention, a jet of steam is caused—while passing through a vessel or reservoir containing a carbon-carrying powder or hydrocarbon liquid—to take away with it a constant or nearly constant proportion of the powder or liquid, so that a mixture of carbon-containing material and steam is formed, which enters a closed chamber, a part of one wall of which, by suitable means, is kept glowing in order to ignite the powder or liquid, and also to cause the decomposition of the steam for the generation of water gas, which escapes from the chamber. Thus the production of water gas takes place continuously, requiring only a uniform jet of steam, the maintenance of the supply of carbon-carrying powder or hydrocarbon liquid for admixture with the jet of steam, and an igniting-device comprising a closed chamber into which the mixture of steam and carbon-containing material for the ignition of the latter enters, and the decomposition of the steam.

By such process, water gas of great purity may, it is said, be produced; but if the main object is the production of gas as cheaply as possible, the process is modified by allowing the igniting-device to act only for igniting the carbon introduced by the steam-jet into it, and introducing air or oxygen (or an oxygen-carrying substance) into the igniting-device for causing the combustion of carbon, and thereby generating the necessary heat for decomposing the steam. This introduction of air, oxygen, or an oxygen-carrying substance into the water-gas generating chamber may be caused by the jet of steam, which, while its flow carries with it the carbon-carrying powder or hydrocarbon liquid, carries also—in a constant or nearly constant proportion—air, oxygen, or an oxygen-carrying substance, which may be mixed with the carbon-carrying powder or the hydrocarbon liquid; or the air, oxygen, or oxygen-carrying substance may be admitted directly into the generator by pipes or the like.



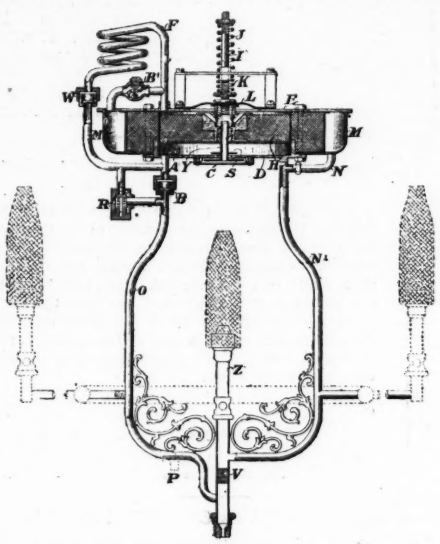
Apparatus for carrying out the process comprises a vessel arranged (as shown) so as to contain a carbon-carrying powder—for example, coal-dust. The supply of the powder to the reservoir B should be such as not to allow its level to fall below the highest point of the holes E (hereafter mentioned). Passing through the vessel is a steam-pipe A normally surrounded for a part of its length by the powder, and having holes E in its sides in the part which is surrounded by the powder. Inside the steam-pipe is a nozzle C, so arranged that the flow of the steam draws the powder through the holes, and carries it along into the closed ignition chamber D in which the steam-pipe terminates. Opposite the mouth of the steam-pipe, the closed chamber has arranged in its wall a plate of refractory material F, kept constantly glowing by means external to the closed chamber. This glowing of part of the chamber-wall is maintained for preference by flames issuing from burners G supplied with gas, preferably attached to a branch K of the water-gas main H, so as to use part of the water gas as generated. Against the glowing part of the chamber-wall the mixture of steam and carbon-carrying powder (which is drawn in through the holes E by the steam passing through the pipe A) is directed; and the powder is ignited by the glowing plate F, which also decomposes the steam in contact with the ignited powder. The result is that water gas is generated continuously, and passes off from the chamber through the main H to a storage holder, or directly to the place of use.

Compressing Gas, Air, &c., for Incandescent Lighting Plant.—Snell, C. S., of Saltash. No. 14,086; July 8, 1899.

In this apparatus for compressing gas or air for incandescent gas-lighting, the attainment of the increased gas or air pressure is effected by the direct expansive action of heat upon the gas or air to be used, without intermediate compressing accessories.

The patentee proposes to make use of a vessel or body A (the cross-hatched portions being of any suitable non-conducting material), fitted with inlet and outlet valves B B^1, whereby gas, air, or the like may enter at the one and be discharged at the other—each valve acting as a check-valve. One side of the vessel (marked D), or an extension (marked C), is heated by any convenient means—such, for instance, as a bunsen burner Z; and the other side E, or an extension F (a coil of tubing), is kept cool by water or other means. Radiation is sufficient in freely exposed situations. Within the vessel A is arranged a displacer H, which may be caused to oscillate, if suspended, or be otherwise put in motion, so as to drive the gas or its equivalent alternately into the hot and cold sections, whereby it is caused to expand and contract accordingly. This vertical oscillation of the displacer is effected as follows: Being suspended on the rod I, its weight is taken by the spring J, and oscillation is retarded in the upward direction by a spring K. The pressure of gas or air within the vessel A, due to expansion through heat, acts on the diaphragm L (or a piston may be fitted instead), thus lifting it and the displacer H, and causing the

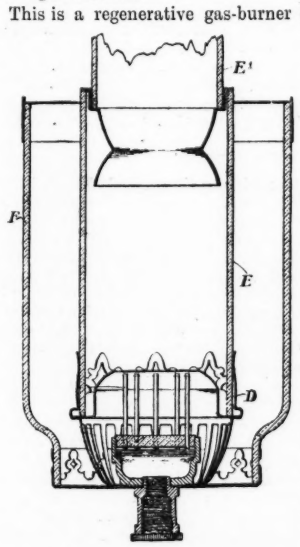
contents of the vessel to be displaced into the lower or hotter section C. By passing the gas or air through the pipe Y, the increasing pressure still further lifts the displacer until the power of the spring K prevents any further advance. Meantime, the gas is also being driven into the reservoir M through the check-valve B^1, and from thence to the burner Z below, or to other lamps on the same circuit (as shown by dotted lines); and when the pressure is greater than that of the incoming gas, the valve



B is kept on its seating—thus shutting off the supply. But so soon as the pressure decreases, through (say) the consumption of gas, the valve B will be opened to the gas supply, and thus a very small fall in the pressure within the vessel A (which must occur in due course) causes a failure to keep the spring K in compression, and the displacer H commences to fall—the valve B^1 at the same time being closed by the pressure in the reservoir M. This movement of the displacer causes the rapid cooling of the gas, by driving it from the vessel A into the cooler portion F of the apparatus through the pipe G and valve W. A partial vacuum results, causing the compression of the spring J until the deficiency is supplied through the valve B, when a rebound follows, and the displacer rises, repeating the cycle already explained; the pressure in the reservoir remaining practically constant. The flow beyond the outlet-valve passes into the service of high-pressure gas (the reservoir M and feed-pipes N and N^1), and is used for the incandescent light Z.

Regenerative Gas-Burners.—Bower, G., of St. Neots. No. 8367; April 21, 1899.

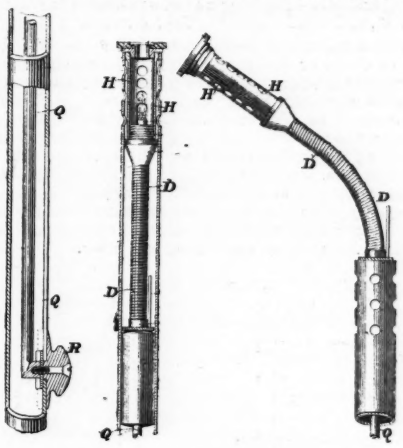
This is a regenerative gas-burner of the double-chimney type, comprising a ring of tubes mounted on a plate which forms the top of the gas-supply chamber. Surrounding the series of tubes is a sleeve D and an annular gallery, and below is a sleeve provided with perforations to permit air to pass to the ring of tubes. The chimney is in two parts E E^1. The lower portion fits into the gallery, and is provided at its upper end with a removable throat-piece, which is formed with a contracted portion; while into the throat-piece the upper part of the chimney fits. An outer cylinder or sleeve of glass F surrounds the chimney E, and is supported by a gallery the bottom of which is closed so that no air can pass up through it to the space between E and F. A ring or band is fitted round the top of the cylinder F (its top edge projecting slightly above the top of the cylinder), and a flat ring or distance-piece placed within the band serves to keep the chimney E in a central position. Openings are formed in the distance-piece to allow air to pass freely down between the chimney E and the cylinder F.



When the burner is in operation, the draught causes air to be drawn down between the inner chimney and the outer cylinder. It is strongly heated in its passage laterally through a perforated sleeve, and circulates among the small tubes of the burner, which, together with the gas passing through them, are heated. The part of the ring or throat-piece which enters the top of the lower portion of the inner chimney is reduced in diameter; the object (according to the patentee) being to cause the flame—which would otherwise be somewhat bulged in the centre—to be drawn in at the top and given the shape of an incandescent mantle.

Lamplighter's Torch.—Foulger, G. F. L., of Upper Clapton, and Glover, J. G., of St. John Street, E.C. No. 23,321; Nov. 22, 1899.

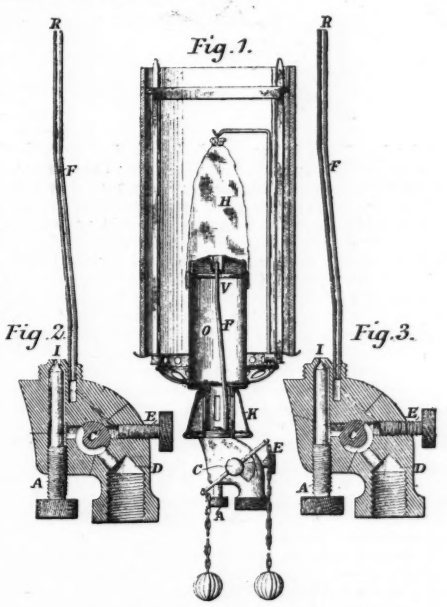
This invention consists in a "flexible wick-tube of an oil or spirit lamp, so arranged within a lamplighter's torch-frame that, by a push or other movement of a rod, the flexible wick-tube can be projected from above the top end of the torch-frame, and be allowed to fall over and above an incandescent burner for lighting the gas—the flexible wick-tube being then drawn back to be within the torch-frame."



When the torch is used for lighting open flames of street-lamps, and the torch-head can be put close to the burner, no motion of the slider R is necessary; but with lamps having incandescent mantles, after the head of the torch has been passed into the lantern, an uprising action on the slider R and rod Q by the lamplighter causes the flame-shield H and the flexible wick-tube D to project beyond the upper end of the torch-stick; the weight of the flame-shield then gradually inclining towards the middle of the lantern and over the incandescent mantle through the flexibility of the wick-tube.

Gas-Burners for Incandescent Lamps.—Bernstein, S., of New York. No. 23,566; Nov. 25, 1899.

The construction of this burner is shown in the engraving—fig. 1 being a complete incandescent gas-lamp with hood suspended over the burner; while figs. 2 and 3 show the part of the complete burner to which the invention particularly relates, in its open and closed positions. Heretofore, in burners for incandescent gas-lights, the patentee remarks, great difficulty has been experienced in securing efficient and convenient adjustment of the supply of the gas to, and an efficient admixture of air and gas in, the air-chamber of the bunsen burner. The supply of the gas used in the bunsen burner has usually, heretofore, been determined by a perforated disc, the perforations of which have been made small or large according to the pressure of the gas estimated at the time of adjusting the burner to the fixture for use. By this method, no regulation of the supply of the gas used can be had at the disc while the burner remains adjusted to the fixture for use.



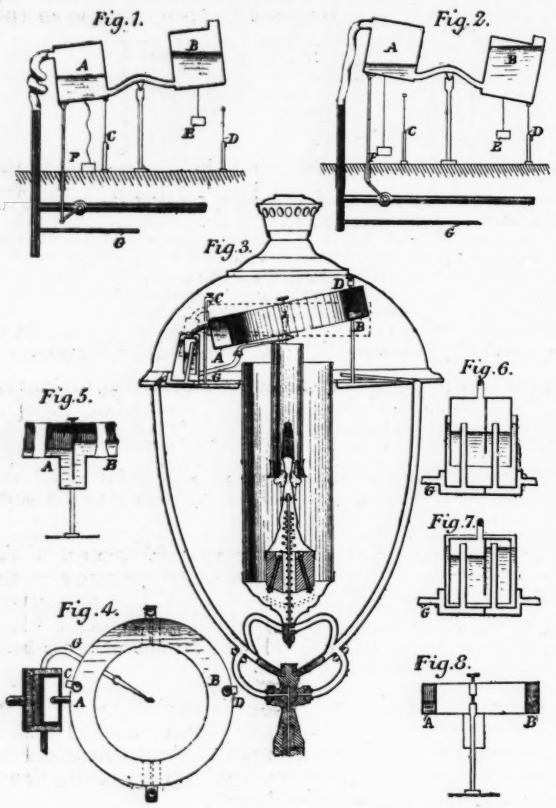
With this invention, the supply of gas, passing through the main gas-inlet D, is regulated at the orifice I, by raising or lowering vertically the regulating-pin A. After passing through the orifice I, the gas mingles in the tube of the bunsen burner O with the air, regulated by an air-shutter such as K; and when lit above, it forms a bunsen flame which renders the hood H incandescent. By revolving the plug C, by means of the rod and chain attachment shown in fig. 1, the course of the gas is changed from the passage leading to the bunsen burner to the bye-passage leading through the pilot-tube F to the pilot-burner R. But before the bunsen flame has been extinguished, the gas is supplied to the pilot-burner, and becomes ignited by the bunsen flame at the orifice V. The supply of gas to the pilot-burner is regulated by the screw E. The flame of the pilot-light does not come in contact with the incandescent hood;

but the subdued light is desirable not only to re-ignite the bunsen flame when the incandescent light of the mantle is again desired, but also for use as a night-light. When the bunsen flame is re-ignited, the pilot-flame is extinguished.

Lighting and Extinguishing Series of Street and other Gas-Lamps.—Croizat, V., of Turin. No. 756; Jan. 12, 1900.

This invention relates to means for effecting the lighting and extinguishing of street or other ranges of gas-lamps from an office or station, by varying the pressure in the mains so that when the pressure is raised beyond a certain limit the lamps are lighted, and when the pressure is lowered to a certain extent they are extinguished. The ordinary pressure is not interfered with, except during the short periods when the lighting and extinguishing are effected. At each lamp, there is a small lighting-flame always burning; and the raising of the pressure opens a passage for gas to the main burner, which is kindled by the lighting-flame, while the lowering of the pressure closes the passage.

Figs. 1 and 2 show diagrammatically how the apparatus acts; the other figures illustrate its practical application to a lamp.

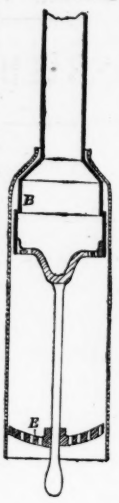


As shown in figs. 1 and 2, two vessels A and B, communicating with each other at the bottom, are poised on a fulcrum; the former vessel communicating by a flexible pipe with the gas-main, the latter vessel open to the atmosphere, or subject to any other approximately constant pressure. When the pressure in the main is increased, liquid passes from A to B, causing the vessels to rock over to the position shown in fig. 2; when the pressure is lowered, the vessels return to their former positions. The vessel A is linked to the lever of the lamp-cock. Thus, by the raising of the gas pressure, the cocks are opened, and the lamps are lighted; and by the lowering of the pressure, the cocks are closed, and the lamps are extinguished. The ordinary variations of the service pressure are not sufficient to move the vessels from the one position to the other—it requires for this purpose a change of pressure sufficient to overcome the effect of the weight of the vessels and their contents acting with the leverage which is determined by the position of the centre of gravity beyond the vertical line of the pivot. Thus, once the vessels have been rocked to the one position or the other, they remain so until there is change of pressure sufficient to overcome the weight acting at the leverage due to their position. The weight and leverage may be adjusted by varying the quantity of liquid in the vessels, the positions of stops C and D, and of the fulcrum, as well as by weights E and F. In the diagram, G indicates the pipe which supplies the small lighting-flame of the cock.

As shown in section in fig. 3 and plan fig. 4, the two vessels A and B are made in one annular piece adjustable on two fulcra by setting screws, and having above it two adjustable screw-stops. The annular piece is divided by partitions on both its sides into the two compartments which communicate with each other at some depth under the partition, as shown in section in fig. 5. The compartment A has from its upper part a pipe and a bell, divided, as shown in section in figs. 6 and 7, into two compartments, having holes through its lower but not through its upper part. The bell is immersed in liquid in a vessel having two tubes, leading respectively from the two compartments. One tube communicates with the gas service-pipe, so that gas from the service-pipe can pass into the compartment A. The other tube communicates with the supply-passage to the lamp.

When the compartments A and B are in the position depicted in fig. 3 (A being down), the bell, as shown in fig. 7, is so deeply immersed in the liquid that no gas can pass from one side to the other, and consequently none passes to supply the lamp, which in that case is extinguished. But when the compartments take the position indicated by dotted lines in fig. 3 (and shown in section in fig. 8), the bell being raised, as indicated in fig. 6, gas passes through holes of the partition shown, to supply the lamp, which is then kindled by the lighting-flame.

Production of Compressed Gas.—Knapp, W., and Steilberg, R., of Hamburg. No. 910; Jan. 15, 1900.



This is an improvement in the apparatus for the production of compressed gas described in patent No. 16,618 of 1899 ("Journal," Nov. 7, p. 1126); the improvement having reference to the arrangement of the lever employed for actuating the pump referred to in the earlier form, and to the introduction of a return-valve in the gas-supply pipe for the reservoir.

Inverted Incandescent Gas-Burner.—Beese, R., of Dresden. No. 2248; Feb. 5, 1900.

This invention in inverted gas-burners for incandescent lamps especially relates to the manner of suspending the incandescent mantle from the head of the burner. The incandescent mantle, which is narrowed on one end in the usual manner, is put with this narrowed end over the bunsen-tube, so as to rest upon the head of the burner; while the lower opening of the mantle is closed by a perforated disc of manganese fastened to the usual supporting-rod, and getting incandescent by the flame.

The manner of suspending the mantle is shown in the sketch. It is put over the bunsen-tube, and resting on the burner-head B with its narrowed end is closed at its lower end by a perforated disc of manganese E, which is fastened to the usual supporting-rod.

APPLICATIONS FOR LETTERS PATENT.

6607.—Langhans, R., "Manufacturing incandescent bodies for illuminating purposes." April 9.
6608.—Boult, A. J., "Gas-burners." A communication from J. Sauvan. April 9.
6625.—Imray, O., "Production of combustible gas from refuse sweepings, waste products, and the like free from carbon monoxide, with or without simultaneous production of cyanogen compounds." A communication from G. Ottermann and Co., and V. Loos. April 9.
6715.—Maris, J. M., "Self-dumping car for coke." April 10.
6729.—Rollason, A., "Gas-motor engines." April 10.
6730.—Thwaite, B. H., "Safety-valve for gasholders." April 10.
6740.—Rault, A., "Generating and storing acetylene gas." April 10.
6857.—Purves, W. T., and The Notkin Syndicate, Ltd., "Carburetting air or gas." April 11.
6865.—Sunderland, R. H. & F., and Marshall, G., "Generation of acetylene gas." April 12.
6882.—Bray, J. W., "Gas-burners." April 12.
6888.—Dodd, A., junr., "Acetylene generators." April 12.
6895.—Graham, M., "Conveying and elevating apparatus." April 12.
6916.—Goodson, J., "Gas-governors." April 12.
6921.—Lake, H. H., "Gas muffle kilns or ovens." A communication from Macario Scuvero and Co. April 12.
6933.—Payne, W. H., "Acetylene gas-generators." April 12.
6971.—Wigham, J. R., "Lighthouse illumination." April 14.
7015.—Borchardt, H., "Means for lighting gas." April 14.
7030.—Brown, D. J., "Gas-generating apparatus." April 14.

The Bingley District Council and the Bradford Bill.—At the annual meeting of the Bingley District Council last Wednesday, the Clerk (Mr. A. Platts), acting under instructions from the Gas Committee, made a report upon negotiations which had passed between him and the Town Clerk of Bradford (Mr. F. Stevens), with regard to the powers now being sought by Bradford to acquire the undertaking of the Clayton, Allerton, and Thornton Gas Company, within whose district of supply the village of Wilsden is included. He was officially informed by the Town Clerk that the Corporation had undertaken to insert in the Bill a clause giving facilities to the authorities in whose districts rights were possessed by the various Companies whose properties the Corporation were seeking to acquire, for the purchase of those rights by the Local Authorities interested. The Clerk added that if this clause were approved by Parliament he did not think it would be necessary for Bingley to go any further with its opposition, as the terms would be quite as good as would be probably gained by opposition. They were like the undertaking given to Cleckheaton and other places. The Council decided to withdraw their opposition if the clause were embodied in the Bill; but power was given for opposition to be made in the House of Lords in case of default.

Trial of Incandescent Gas Lighting in Norwich.—The Norwich Town Council recently had before them a report from the Executive Committee upon lighting certain streets in the city with incandescent gas-burners, accompanied by a recommendation that the Committee should be authorized to put up an installation of about 125 lamps, with fittings and burners, to be fixed by the Street Lighting Company, Liverpool, for three months, for experimental purposes, at a cost for temporary attachments of a sum not exceeding £25, on condition that if the experiment be satisfactory to the City Engineer, the lanterns and fittings shall be purchased by the Corporation at a price not exceeding £2 2s. 10d. each. Mr. Cunnell moved the adoption of the report, and stated that the new system would not cost more than the old one, and would furnish a much better light. Mr. Mallett feared this was the thin end of the wedge, which would bring about an expenditure of between £6000 and £7000 a year. He suggested that the Electric Lighting Company should be approached to see what they would charge for illuminating the streets. He therefore moved that the question be referred back to the Committee for them to consider the advisability of having the electric and gas light experiments carried out in various parts of the city. On a division, the amendment was lost by a majority of 14, and the report adopted.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Commercial Company's Make of Gas.

SIR,—Is there not some mistake in the case of the Commercial Company in the figure of gas produced per ton of coal in your table of comparison between the Chartered, the Commercial, and the South Metropolitan gas? In point of fact, the make per ton in the June half of 1899 was 10,313 cubic feet, and in the December half 10,256 cubic feet—averaging under 10,300 cubic feet. Of course, it will not do to make a calculation spreading the make of gas produced from carburetted water gas over the tons of coal used.

HY. E. JONES,
Engineer and General Manager.

Stepney, E., April 19, 1900.

[The discrepancy between our correspondent's figures and those in the table referred to appears to have arisen in converting the quantity of oil used into the equivalent of cannel. Although the figure adopted for this purpose was the one which has been generally accepted, it does not appear to accord with actual working results. It was recognized that differences of manufacturing practice considerably affect the make of gas; and this fact was taken to account for the divergent results shown in the table.—ED. J.G.L.]

Naphthalene in Coal Gas.

SIR,—I thank Mr. Allen for his remarks, *re* my letter, on the above subject. I felt sure that there was some mistake in the figures alluded to, which would be better rectified.

With regard to Dr. Colman's letter, I fully understand—in the light of his fuller explanation—that the partial contact of a slight excess of wash water with naphthalene picrate would not exert its *fullest* solvent action, and that the error would therefore be correspondingly small. The figures I gave as to naphthalene in gas ("1·5 grains per 100 cubic feet to *nil*") were quoted from Messrs. Colman and Smith's paper; but, on re-reading the remarks accompanying the figures, I see that I was wrong in terming this proportion of naphthalene "normal." I must confess that I was unaware that naphthalene was formed from the breaking up of liquid paraffins into permanent gases at such temperatures as are employed in the manufacture of carburetted water gas. With regard to this description of gas as contrasted with normal coal gas, it would, I think, at least be safe to assume that the former would be comparatively free from naphthalene, as by far the greater bulk is produced from coke and steam. I have made inquiries, and am informed that in one particular case no trouble with naphthalene has ever occurred in the working of a large water-gas plant; but whether this is the universal experience, I am unable to say.

H. LEICESTER GREVILLE.

April 20, 1900.

The Improved Lighting in the South Metropolitan District.

SIR,—In your appreciative notice of the improvements in public lighting we have been making, you give us credit for greater liberality than is our due. We have only agreed to substitute the new "Eddystone" columns for old ones in the main leading thoroughfares selected by ourselves. If the parishes want them elsewhere, of course, they can have them by purchase.

The new "South London" lantern (as we have christened it), and the "Eddystone" column have been protected by the Company; the peculiarity of the latter being the design, and of the former the unequal arrangement of the ribs—thus placing the shadows in a harmless position. The form of the lantern—circular, not pentagonal—moreover has the effect of causing the shadows of the ribs almost to disappear at a short distance from the lamp. We do not wish, however, to keep a good thing to ourselves—being quite willing to give permission to any company or local authority to use either the "Eddystone" column or the "South London" lantern on nominal terms. The Croydon Gas Company applied for such permission, which was granted for all the lamps they may use for the single payment of £1. I mention this because I heard of a tradesman giving as an excuse for his price the item of royalty, which is purely nominal.

I may say that among other forms of lanterns we tried the pentagonal, which, to our surprise, made a far better appearance than the hexagonal form. If a polysided lantern is wanted, I certainly recommend the pentagonal to any other with more than four sides.

One other word, to give credit where it is due. The lighting of the Camberwell Art Gallery is due to Mr. Carpenter, both in conception and execution; and that of the Vestry Hall is also due to him, assisted by Mr. Talbot, our Lighting Inspector.

GEORGE LIVESEY.

South Metropolitan Gas Company, April 21, 1900.

Illicit Commissions.

SIR,—In your article this week on the above question (and to which I hope you will continue to draw attention, for although the evil be diminishing, not increasing, it is still of sufficient magnitude to be of serious importance), you make the remark that, if the Lord Chief Justice's Bill become law, "a good many worthy individuals will have to seriously consider various things." That is so; and it is true that those individuals do consider themselves, and are considered by the crowd, "worthy."

May I, however, rescue from the oblivion of Hansard a story told by Lord James of Hereford in his speech upon the second reading of Lord Russell's Bill? Some years ago—the story runs—a suit was instituted before the late Master of the Rolls (Sir George Jessel) by a large firm of merchants at Bombay, who complained that their shipping agent in Lancashire had systematically charged them with a very large amount of commission which he had no right to charge. Investigation showed that there were two invoices used, and that the transactions were so conducted as to make a difference of 70 per cent. in favour of the commission agent. In the course of the hearing, Sir George Jessel inquired of the eminent Counsel for the defendant what was the answer to the complaint; and the reply was that the practice was universal in that particular trade throughout Lancashire, and was prevalent elsewhere. Counsel said that he had a large number of respectable people in Court to give evidence in proof of the fact that the practice was universal. The Judge said: "You can send those 'respectable' people home; the sooner they leave the Court the better;" and judgment was found in favour of the merchants.

Substitute "worthy" for "respectable," and the story makes my point. You say that palm-oiling is already disreputable. Outside certain circles, that is true. But how comprehensive some of these circles are, is only too notorious; and the number of "worthy" people contained therein, who shall compute it? The old Latin saying is still too often true: "*Probitas laudatur et alget.*"

F.

April 18, 1900.

MISCELLANEOUS NEWS.

PARIS GAS COMPANY.

The Report and Accounts for the Year 1899.

The following is an abstract translation of the report of the Directors of the Paris Gas Company on the working of the undertaking in the year ending Dec. 31 last, with the principal items in the accounts.

In the year 1899 there was a further augmentation in the consumption of gas in Paris and the 59 neighbouring communes served by the Company; the quantity sent out for consumption being 325,874,001 cubic metres, or about 11,503,352,000 cubic feet, as compared with 320,031,250 cubic metres, or 11,297,103,000 cubic feet, in the preceding twelve months—an increase of 5,842,751 cubic metres, or 206,249,000 cubic feet. This is ascribed, on the one hand, to the normal growth of the consumption, to which the 27,636 new customers obtained in the year contributed; and, on the other, to the effect of the dull weather which prevailed during the latter portion of this period, as well as to the preparations being made for the International Exhibition, which was opened on the 14th inst. The day consumption of gas continues to increase regularly. Last year it reached 109,435,483 cubic metres, or about 3,863,073,000 cubic feet; being 4,580,583 cubic metres, or 161,695,000 cubic feet, more than in 1898, and representing 33·55 per cent. of the total. The receipts amounted last year to 82,630,736 frs. (£3,305,230), or an advance of 1,658,992 frs. (£66,360) on those for 1898. Of the total, 75,125,118 frs. came from the city, and 7,505,618 frs. from the surrounding districts. The number of consumers on Dec. 31 last was 425,276, or, as mentioned above, 27,636 more than at the corresponding date in 1898. The increase in the past twelvemonth was 1563 greater than that for the previous year, and was the result of a further accretion of the number of consumers whose supply of gas is laid on without cost to them. In 1898 there were added 123,292 customers of this class; whereas last year there were 140,776—a difference of 17,484. It is rather remarkable that of the 27,636 new consumers last year, the proportion of those of the ordinary class was greater than in 1898; being 10,152, as compared with 7675. This improvement is due to the exertions of the Company's lighting inspectors, which result in the diminution of the unproductive installations. The number of burners in the public lamps on Dec. 31 was 62,409, of which 50,516 were employed in lighting the city, and 11,893 were in use in the suburbs. These figures show a decrease of 3375 burners in the city, but an increase of 201 in the suburbs—a net reduction of 3174 in the year. The lower figures for the city are due for the most part to the temporary disuse of a large number of lamps in certain public thoroughfares now comprised in the area covered by the Exhibition, and likewise to the substitution of incandescent gas-burners for those of the ordinary kind. At the close of the past two years, the number of burners of various types employed was as follows:—

Kind of Burner.	1898.	1899.	Inc.	Dec.
Ordinary	47,947	38,599	—	9,348
Auer	1,723	8,735	7,012	—
Denayrouze	393	1,877	1,484	—
St. Paul	229	1,164	935	—
Regenerative	3,599	141	—	3,458
Total	53,891	50,516	9,431	12,806

While the effect of this extended use of incandescent burners is to decrease the consumption of gas for municipal lighting, it at the same time improves in a very considerable degree the general illumination of the streets. The incandescent gas system is also being extended to the suburbs; and the Directors are of opinion that it will develop greatly as time goes on—it being more economical than electric lighting, while producing equally good results.

The number of rising mains fixed by the Company in the past twelve months was 1500; bringing up to 48,200 the number in use on the 31st of December. They serve 288,441 consumers, against 263,393 at the close of 1898; the proportion to the total number being 66·24 per cent. then, as compared with 67·82 per cent. now. These improved figures show that the introduction of electricity into the Paris houses has not been so inimical as might have been supposed to the development of gas consumption. In fact, the ordinary consumers taking their supply from these rising pipes burnt 55,489,538 cubic metres, or 1,958,781,000 cubic feet, of gas in 1898, whereas last year they used 57,364,286 cubic metres, or 2,024,959,000 cubic feet—an increase of 1,874,748 cubic metres, or 66,178,000 cubic feet. The efforts of the Directors to extend the use of gas among this class of their customers have, therefore, not been fruitless.

With regard to the works and plant, no change of any importance was made last year; the various stations being equal to the demands made upon them. Extensions of mains were, of course, required; and about 24,778 yards of pipes were put down—17,327 yards in the city, and 7451 yards in the suburbs. This brought up the total to about

1541 miles. There was a net sum of 4,645,404 frs. (£185,816) expended for capital purposes last year, or about £36,758 more than in 1898. The capital account stood as follows at the close of the year:—

	Francs.	Sterling.
Amount expended to Dec. 31, 1898	320,098,496	£12,803,940
" " during 1899	4,645,404	185,816
Total	324,743,900	£12,989,756

To meet this there has been raised: By shares, 84,000,000 frs.; by bonds, 254,004,189—together, 338,004,189 frs. (£13,520,167). There is consequently an unexpended balance of 13,260,289 frs. (£530,411). The capital is represented by 336,000 shares and 553,332 bonds. Up to the date of the report, there had been redeemed 230,679 shares and 330,403 bonds; so that 105,321 shares and 222,929 bonds remain to be redeemed before the expiration of the concession in 1905.

The following is the working account for the past year:—

Expenditure.

	Francs.	Sterling.
Value of gas in store on Jan. 1, 1899	59,857	£2,394
Manufacture of gas—		
Coals carbonized	21,538,251	861,530
Coke and tar for heating purposes	4,673,976	186,959
Salaries and wages	5,103,505	204,140
Maintenance of works and plant	2,097,636	83,905
Incidental expenses of carbonization	1,412,318	56,493
Purifying materials and labour	312,596	12,504
Distribution—		
Salaries of engineers and officers	2,671,115	106,844
Repairs, &c., of mains and services	2,084,232	83,369
Miscellaneous expenses, stamps, &c.	479,368	19,175
General management (including interest and sinking fund payments)	27,079,538	1,083,181
Pension and provident funds	1,929,342	77,174
Municipal charges—		
Tax of 2 c. per cub. met. of gas sold.	5,502,489	220,100
Rent of subsoil occupied by mains,&c.	200,000	8,000
Lighting, extinguishing, and maintenance of public lamps (less amount paid by Municipality)	1,379,070	55,163
State charges—		
Official gas testing, stamps, &c.	1,068,590	42,744
Total expenditure	77,591,883	£3,103,675

Revenue.

	Francs.	Sterling.
Value of gas in store on Dec. 31, 1899	33,129	£1,325
Sale of gas	82,630,736	3,305,230
Residual products—		
Coke	14,957,661	598,306
Tar	1,563,020	62,521
Ammoniacal liquor	1,925,693	77,028
Rental of meters and fittings on hire	1,934,855	77,394
Fire-bricks, &c.	47,121	1,885
Interest and discount	1,105,336	44,213
Total revenue	104,197,551	£4,167,902
Deduct expenditure	77,591,883	3,103,675
Balance, profit for 1899	26,605,668	£1,064,227
Add balance of 1898 liquidation	6,690	267
	26,612,358	£1,064,494
Deduct to meet outstanding claims	262,358	10,494
Balance available for distribution	26,350,000	£1,054,000
Deduct for share dividend	11,200,000	448,000
Balance, divisible equally between the Company and the Municipality	15,150,000	£605,000

The total amount coming to the shareholders is therefore:

	Francs.	Sterling.
Dividend as above	11,200,000	£448,000
Half of divisible balance	7,575,000	303,000
Placed to shareholders' credit, as per resolution of March 23, 1875	50,000	2,000
Balance of undivided profits	196,198	7,848
Total	19,021,198	£760,848
Deduct 1 fr. per share for reserve fund.	336,000	13,440
Balance	18,685,198	£747,408
Deduct interim dividend of 12 frs. 50 c. per share paid in October last	1,500,837	60,033
Balance	17,184,361	£687,375

This balance, if it were all available, would allow of the declaration of a dividend of 63 frs. per ordinary, and 50 frs. 50 c. per preference share; but, by virtue of a decree made on June 27, 1898, by the Prefectorial Council of the Seine (from which, however, the Company have appealed to the State Council), a sum of 1,349,521 frs. has to be placed to a suspense account, pending the result of the proceedings. In these circumtances, the disposable balance is 15,834,840 frs. (£633,394), which will allow of the payment of a final dividend of 46 frs. 50 c. per share. Adding the interim dividend of 12 frs. 50 c. per share and the portion of the divisible balance held in reserve (equal to 4 frs. per share), the total dividend for the year is 63 frs., or 50 c. more than that for 1898. This will leave a balance of 210,840 frs. (£8434) to be carried forward. The higher dividend, notwithstanding increased expenses, is explained to be due to the greater quantity of gas consumed, to the profits realized by the sale of coke and ammoniacal liquor, and to the economy exercised generally in all departments of the undertaking.

Reference is made to the great rise which has lately taken place in the price of coal. Under the long contracts which the Directors entered into before the advance, the necessary deliveries of coal were made last year without any appreciable additional expense being incurred. These contracts cover the larger portion of the supplies required during the current year; and consequently the accounts will not be affected to anything like the extent they would have been if purchases had had to be made at present rates. Moreover, the Company are provided with the extra quantity required owing to the exceptional consumption since the latter months of last year.

Coming to the portion of the report dealing with the residuals, the Directors record a revenue of 14,957,661 frs. (£598,306) from the sale of coke; being 393,846 frs. (£15,754) more than in the preceding year. The improved market which allowed of the realization of this substantial increase did not prevent the reduction of the stocks, which at the close of 1899 were much lower than they were at the corresponding period of 1898. Moreover, the contracts entered into at the beginning of 1899 were based upon the very moderate rates then ruling; whereas those concluded for the present year have been made under more advantageous conditions, and consequently they will compensate in a large measure for the additional expenditure arising from the high price of coal. Tar and liquor were also sold with better results last year; the total revenue from these two products—3,488,713 frs. (£139,549)—showing an increase of 462,888 frs. (£18,516) on that for 1898. This improvement arises partly from the better prices obtained for the liquor; but it is also attributable to the increased quantity of prussian blue contained in the spent purifying material, which has enabled the Directors to sell it more profitably.

There is no diminution in the interest taken by the public in the Company's show-rooms; the number of visitors last year being 44,696, or 1394 more than in 1898. Orders were received for 6549 gas appliances, either of the Company's construction or those of other makers on view. Of this number 2715 were cooking or heating stoves, and were quite independent of the 24,597 small stoves which the Company lent gratuitously; bringing up to 315,936 the number in use at the close of the year. These figures show the extent to which gas is used for culinary purposes in Paris. It is much the same with other kinds of gas appliances, employed in industrial operations. The Company encourage, by means of premiums, this special use of gas. The utilization of gas for the production of motive power continues to make progress. At the close of last year, there were at work in Paris and the surrounding communes 2989 gas-engines, furnishing about 12,590-horse power—an increase of 193, representing 1630-horse power, on the number in operation in 1898. The quantity of gas consumed by these engines reached 10,103,000 cubic metres, or rather more than 356½ million cubic feet; being an increase of nearly 19 per cent. on the consumption in 1898. The average power of the engines put up in that year was 6-horse; whereas last year it was 8-horse. The conclusion to be drawn from this fact is that motors of the higher powers will be those more generally employed in the future; and, of course, this will lead to a corresponding increase in the quantity of gas consumed. It is to the production of the larger types of engines that the efforts of makers are now being directed; and the result will be a new opening for the gas industry.

The report furnishes, as usual, full particulars in regard to the provident, pension, and savings funds connected with the Company. Last year the expenses of the provident fund amounted to 555,994 frs. (£22,240); whereas the receipts—which consisted mainly of 1 per cent. deducted from the Directors' fees and the salaries of employees, making 204,166 frs., and a like sum contributed by the Company—were only 419,251 frs. (£16,770). The deficiency has been made up, as usual, by the Company. As from the 1st of July last, the Directors have adopted the provisions of the law of April 9, 1898, in regard to workmen's accidents. There are two pension funds—one for the men engaged upon the works, and the other for the clerks, &c. The balance of the former at the close of the year was 960,345 frs. (£38,414); and of the latter, 9,658,046 frs. (£386,322). The savings fund balance was 290,486 frs. (£11,620).

The Directors could not close their report without some reference to the part which is being taken by the Company in connection with the Exhibition. As our readers are aware, a Gas Pavilion has been erected in the grounds by the Société Technique du Gaz en France; and towards the expenses attending this work the Company have contributed. They are also showing, in various classes, some of the most interesting of the appliances used in the manufacture of gas, as well as specimens of the residual products. But it is in the domain of lighting that the Company will make the best display. The Directors thought it would be advantageous to the gas industry to show the progress made in lighting since the Exhibition of 1889 by the application of the incandescent system. They therefore arranged with the authorities of the Exhibition that they should be allowed to light the parks in the Champ de Mars and the Trocadéro, in conjunction with the French Welsbach Company and the Denayrouze Company. Owing to the increase in the number and power of the burners as compared with those originally arranged for by the Administration of the Exhibition and to the use of compressed gas, the quantity of light at first contemplated will be increased fivefold. This illumination of two of the most frequented parts of the Exhibition will constitute, in a measure, the Company's personal exhibit. In addition to this, they have obtained from the proprietors of certain refreshment establishments promises to employ gas exclusively as the fuel for the stoves and other culinary appliances placed at their disposal by the Company, or to obtain their motive power from gas-engines. While showing themselves keenly alive to the Company's interests at this period of great business and general activity for the city, the Directors are not unmindful of the fact that the large influx of visitors invariably resulting from international displays such as that which will shortly be completed on the banks of the Seine, is followed by a rise in the price of all the necessaries of life; and they could not disregard the result of this increase on the resources of those most liable to be affected by it. They therefore propose to distribute, between the 1st of May and the 31st of October, a sum of £16,000 in two equal parts, to those of their employees whose salaries are £105 or less per annum, and to all the workmen without exception. This is, on a rather larger scale, the course adopted on the occasion of the Exhibition of 1889.

Reference has already been made to the appeal of the Company to the State Council against the decree of the Prefectorial Council of the 27th of June, 1898, in reference to the amortization of their share capital. As the matter is *sub judice*, and a decision thereon is expected shortly, the Directors can only express their belief in the correctness of their reading of their Treaty with the Municipality on the points in dispute—a reading which is supported by those who drew up the document

originally. With regard to the question of the reduction of the price of gas, and a prolongation of the concession, which has been under consideration by the Company and the Municipality more or less since 1892, nothing definite has yet been arrived at. The Directors are sincerely desirous of coming to some satisfactory conclusion on this matter. But the question is one which concerns three parties—the consumers, the Municipality, and the Company; and in any settlement the interests of all must be duly considered.

WIDNES CORPORATION GAS SUPPLY.

Tar Process Abandoned in Favour of Enrichment by Benzol and Carburine.

A significant report has been presented to the Gas Committee of the Widnes Corporation by Mr. Isaac Carr, their Gas and Water Engineer, and adopted by the Town Council. He informed the Committee that the eight single benches of retorts forming the portion of the carbonizing plant known as the "tar beds" would require renewing this season; and, in carrying out the work of re-erection, he recommended that the system of tar enrichment should be discontinued, and that the retorts should be set "in a manner similar to those in the new retort-house." He further recommended that "benzol and carburine spirit should be substituted for the tar as a means of enrichment." In explaining the reasons for these recommendations, Mr. Carr said: "It is necessary to point out that the conditions under which the system of tar enrichment was of value in the first years of its history have gradually altered, until they have now practically disappeared. Twelve years ago—*i.e.*, the period of the introduction of the process—tar was so low in price and so difficult of disposal that a large quantity was used as fuel for heating the retorts in place of coke. Cannel, the then only means of enrichment, was very high in price; oil enrichment, as now recommended, being unknown. Of late years tar has appreciated very considerably in value; cannel has fallen to nearly half its former price; and oil spirit and benzol, as an economical and efficient means of permanent enrichment, have come into general use. The cost of enrichment by means of cannel, at to-day's prices, might be stated at a little over 1d. per candle per 1000 cubic feet. Compared with benzol and carburine, tar enrichment is both more costly and more difficult of application." Mr. Carr added that a further consideration in favour of the substitution of oil enrichment was that it was likely, in a measure, to prevent, or at all events to afford some relief in the event of, another visitation of "the elusive naphthalene difficulty" such as was experienced in the latter part of last year.

WATER-GAS PLANT FOR MACCLESFIELD.

A short time ago, the Gas Engineer of the Macclesfield Corporation (Mr. Ernest L. Newbigging) was asked by the Gas Committee to report to them upon the question of introducing some kind of auxiliary gas-making plant; and at the meeting of the Committee last Wednesday, he complied with their request. He commenced by stating that there is only one kind of such plant in existence—viz., that for making carburetted water gas—which, he said, had been erected at nearly all the largest gas-works in the world, and had proved an unqualified success. He advised the Committee to adopt this process in conjunction with the existing coal-gas plant. Having described the method of making water gas, Mr. Newbigging gave twelve very good reasons to justify his recommendation. By means of a plan, he indicated the best position on the works for the erection of the new plant, and then passed on to deal with the question of cost. He stated that one complete section of the plant, to make 300,000 cubic feet of gas per day, and arranged for duplication at a slight outlay, would cost, in round figures, £2800; a duplicate steam-boiler plant, each boiler being large enough for two sections of generating plant, would cost about £900; an oil-tank, £350; buildings, £2000; relief holder, 36 feet by 16 feet, in steel tank, £725; purifying plant, consisting of four purifiers, 16 feet square and 4 ft. 6 in. deep, with 12-inch centre-valve and connections and traveller, £1300; yard connections and foundations, £400—total, £8475. Supposing the Committee were able to borrow this amount at 3½ per cent, the cost would be £300; but as they would lose the rent of certain cottages cleared away, about £100 would have to be added—making £400 in all. Mr. Newbigging then considered the value to the undertaking of the auxiliary plant he recommended. On this point he said: "You have made during this year about 165 million cubic feet of gas; your increase having been about 12 millions over the preceding year. Suppose, by the time you get this plant erected, you are making 175 millions, and you made 25 per cent. of water gas—that would be about 44 millions. You are able here to make coal gas as cheaply as in most works; and I see no reason why you should not make water gas as cheaply too. Manchester makes water gas at about 4½d. per 1000 cubic feet less than coal gas. We will say that you could make it at 3d. less; then 44 million cubic feet of water gas at 3d. per 1000 cubic feet is £550 saving, or £150 more than the interest on the borrowed money and the house-rents, without taking into consideration the saving in cannel, the cost of more storage, wear and tear in the retort-house, and the saving in not having to buy land to increase our present coal-gas manufacturing plant." He added that there was no nuisance, except the noise caused by the working of the engines, from water-gas plant; and that although some opposition had been offered to the gas on account of its alleged poisonous nature to some extent, the fears on this score had almost vanished. In conclusion, he expressed the opinion that the way he had indicated to the Committee was by far the best and most economical one of increasing their manufacturing plant. In a note appended to his report, Mr. Newbigging stated that since its preparation the price of oil had almost doubled; and that consequently, under the altered circumstances, water gas could not be made much, if any, cheaper than coal gas. He pointed out, however, that the other advantages—such as the consumption of a smaller quantity of coal and cannel, the need for less storage, and so forth—would remain, as well as the absolute necessity for more carbonizing plant. The report was discussed at some length; and it was eventually decided that it should be placed before the Council, and be again considered by the Committee at a future meeting.

WHITWICK AND COALVILLE GAS ARBITRATION.

Thursday, April 19.

(Before Mr. SHIRESS WILL, Q.C., *Umpire.)*

This was an arbitration to decide the amount to be paid by the Coalville Urban District Council for the undertaking of the Whitwick and Coalville Gas Company. The proceedings took place at the Westminster Palace Hotel, London. Mr. ALFRED COLSON was Arbitrator for the Company, Mr. CORBET WOODALL for the Council. Mr. C. A. CRIPPS, Q.C., M.P., and Mr. HONORATUS LLOYD appeared for the Company; Mr. BALFOUR BROWNE, Q.C., and Mr. RAM, Q.C., for the Council.

Mr. CRIPPS, in opening the case, said the purchase was sanctioned by an Act obtained in 1899 by the Council; and under section 5, sub-section 2, it was provided that, in case of disagreement, the price was to be fixed by arbitration in accordance with the provisions of the Lands Clauses Acts. The Council were to pay the actual cost the Company incurred in obtaining their Act in 1898, the expenses of winding up the Company, and compensation to officers and servants in the regular employment of the Company; but the Arbitrators should not have regard, in determining the price, to the fact that the Company were incorporated by Act of Parliament. The Company were not to be compensated as though they were a statutory Company, which affected the number of years' purchase; and, on the other hand, the Company were not to be considered as subject to limitations of dividends, which were imposed when a company obtained statutory powers. Messrs. Lass, Wood, and Co. had taken out the accounts; and both sides had agreed to abide by their figures. The capital consisted of £8000 of 10 per cent. stock and £2000 of 5 per cent. stock. The loan capital authorized was £3750, of which £2500 had been raised. The Council would take this over. The tables showed that the total capital expenditure was £12,815 9s. 7d., and that the payments for parliamentary costs in 1898, when the Company obtained their Act, were £1285 14s. 9d. The profit on gas was £954 in 1896, £1142 in 1897, £725 in 1898, and £1577 in 1899—the year in each case ending at June 30. The substantial question was whether this profit of £1577 in 1899 was maintainable or not. The variations in the profit arose to a great extent because, in a small concern of this kind, capital charges were being constantly paid out of revenue, particularly in matters of repair and maintenance. In this case, the witnesses put the figure for repairs and renewals at 5d. per 1000 cubic feet. The cost per 1000 cubic feet for repairs and maintenance of works and repairs and maintenance of mains and services, were as follows: In 1896, 2·63d. and 6·36d. respectively—a total of 8·99d.; in 1897, 3·13d. and 1·78d. respectively—a total of 4·91d.; in 1898, 6·79d. and 9 75d. respectively—a total of 16·54d.; and in 1899, 4·68d. and 0·92d. respectively—a total of 5·6d. The figures in 1898 were enormous, and he believed were due to the Company laying mains, or doing work of that kind. The actual sum spent in the last year was 5·6d., and the figure taken was 5d.; so that there was an adjustment in regard to the 0·6d. of difference, which worked out to £35 2s. 9d. Then the Manager was a sort of handy man as well; and he did many minor repairs and things of that kind himself. It was, therefore, held that half his wages should be allowed, in the sense that they should not be put down against the profits of the concern. His wages were £91; so that the half would be £45 10s. These two figures made £80 12s. 9d., and, added to the £1577 3s. 11d., gave £1657 16s. 8d. There were certain mains which had been laid by the Company, 10 per cent. of the cost of which had been paid by the Council on condition that, where consumers were obtained on the mains, a third of the amount derived from the consumers should go against the liability of the Council. Last year £14 4s. 7d. was obtained from the Council in this way; and this, with £18 0s. 11d. rent derived from certain cottages, made £32 5s. 6d., which, deducted from the £1657 16s. 8d., left £1625 11s. 2d., which the Company said was the maintainable profit. The multiplier adopted was 26⅔ years; and this gave £43,348 4s. 5d. To this was added the rent of the cottages, capitalized at 22½ years' purchase, and the sum received from the Council in respect of the mains, capitalized at 10 years' purchase; these two sums being £405 12s. and £145 5s. 10d. respectively. The late Manager, who was now about 70 years of age, was allowed £72 16s. a year. He was about the place, and was employed in various ways. Half of this sum—£36 8s.—was multiplied by 26⅔, because it would come into profit later on, but not until he died. His expectation of life being eight years, this had to be multiplied again by 0·7894. This brought out £608 7s. 3d. He also received a house and gas, which were equivalent to £10 8s. This was capitalized at 22½ years' purchase, and again multiplied by 0·7894 for the eight years, which gave £182 13s. 4d. These additions to the £43,348 4s. 5d. made the figure of £44,687 2s. 10d. Beyond this, there was the question of prospective value under the head of surplus lands, works, and mains; and this Mr. Stevenson estimated at £3581 10s., which increased the total to £48,268 12s. 10d., or, *plus* the 10 per cent. allowance for the sale being compulsory, £53,095 10s. 1d. From this, however, had to be deducted £2500, the amount of the debt taken over, leaving £50,595 10s. 1d. In addition, there would be sums for the cost of obtaining the Act and of winding up.

Mr. *Samuel Wood*, of Messrs. Lass, Wood, and Drew, handed in tables relating to the affairs of the Company which, acting for both sides, he had prepared. In reply to Mr. Balfour Browne, he said the repair and maintenance of works and plant amounted in 1898 to £355 13s. 3d., and sank to £274 4s. 10d. in 1899; and the repair and maintenance of mains and services in 1898 was £511 1s. 10d, while in 1899 (the account year) the figure sank to £54 1s. 4d. The £511 in 1898 included part of the cost of laying a new 10-inch main in place of a 6-inch one, less value of old pipes taken up and sold. This was the ordinary way of dealing with a matter of this kind. This large renewal was commenced in 1896, but was paid for in 1898. The coal cost practically the same in 1899 as in 1898; but coke went up considerably—the average price per ton in 1897 being 6s. 7d., in 1898 6s. 9d., and in 1899 8s. 5d. In 1898, the profit on gas was 13·85d.; and in 1899 it went up to 26·93d. The dividends in 1898 were 9·16d., and in 1899 13·83d. The standard price was 4s. 2d. The Company had some very large customers. In 1899, the total quantity of gas consumed by ordinary customers was 6,578,300 cubic feet, of which Messrs. Stableford and Co. took 2,408,600 feet, the Midland Railway Company practically a similar amount, Messrs. Wootton Bros. about

500,000 feet, the Constitutional Club 257,000 feet, and the Liberal Club 224,000 feet.

Mr. *E. H. Stevenson*, examined by Mr. CRIPPS, said the general progress of the Company had been exceedingly satisfactory; the growth for the past ten years being over 8 per cent. per annum—a high rate of expansion. There were few places which could maintain such a rate of increase over ten years. Coalville sprang into existence in that ten years, and had grown enormously. Even now there was margin for considerable extension as between the number of houses in the town and the number which took gas. There was no question the Company would now have been selling much more gas if, during the past three years, there had not been an agitation for the purchase of the concern, which had caused the Company to hold their hand as regards capital expenditure on mains. If the Company had extended their mains very largely, the capital employed would not have come into operation, and the Company would have lost greatly when the purchase took place. In the last account year, there were 85 new consumers out of a total of 374. There were consumers only where mains had been put; and not half the district had mains. The district was of a mining character, and contained iron and various other works largely dependent on coal, of which there was plenty. The Company laid a 10-inch main from the gas-works to the centre of the district, part in 1896 and the remainder in 1898; and this accounted for the variation in the profits. This was in place of a 6-inch main. Its length was 2300 yards; and two-fifths of the cost was paid out of capital, and three-fifths out of revenue. This was sufficient for about double the present supply; the maximum output in 24 hours in the account year (which ended at June, 1899) being 85,000 cubic feet. The mains generally of the Company were unusually large. More than a quarter of them were 10 inch, there were 600 yards of 6 inch, 1900 yards of 4 inch, 8800 yards of 3 inch and 300 yards of 2 inch. There was excess capacity in the retort-house of 50 per cent. It had a bench of five arches, with room for another arch. Four of the arches were set with retorts; but only three were used ordinarily in mid-winter. The fourth was requisitioned this winter, because Leicestershire coal, instead of the usual kind, had to be used. The coal-shed had a capacity of 250 tons, which was five weeks' storage under cover for the maximum weekly make. This was quite sufficient. The engine-house and boiler-house were very ample. There was little, if any, margin in the condensers; but the two scrubbers (one being 15 feet high and 3 feet in diameter, and the other 30 feet high and 5 feet in diameter), the Livesey washer, and the four purifiers (which were 9 feet square, and practically new) were considerably in excess. The meter—quite new, and with a capacity of 7000 cubic feet per hour—was 100 per cent. in excess. The two gasholders were of 20,000 and 60,000 cubic feet capacity respectively, which was in excess of requirements. The other necessary equipment—tar and liquor tanks, the manager's house, cottage accommodation, &c.—was all amply sufficient and up to date. Adjoining the works was a plot of spare land, with an area of 2148 square yards, available at any time for the purposes of the works. The unaccounted-for gas in the last two years having been only 7·5 and 8·03 per cent. respectively, showed that the mains and pipes were in very good condition. In his valuation, he started with the figure of £1577 3s. 11d. shown by Mr. Wood as the profit for the year ending June 30 last—this being the proper year having regard to the date of the notice. The right figure to allow for repair and maintenance of works and repair and maintenance of mains and services was 5d. per 1000 cubic feet; the high figures shown in the accounts being due to such things as the laying of the 10-inch main and charging three-fifths to revenue, and other new works. Adjusting the outlay on this basis, the actual expenditure in 1899 having been 5·6d. gave £35 2s. 9d., which, with £45 10s. half the wages of the Manager, he added to the £1577 3s. 11d.—making £1657 16s. 8d. The Manager did nearly the whole of the repairs about the works, and all the repairs to mains and service-pipes. His wages had not been allocated to repairs and maintenance in the accounts; but they ought to have been taken into consideration in arriving at the figure of the year's profit. A part of his wages was included in the 5d. per 1000 cubic feet; and witness therefore made the allowance, as stated, of half his wages. Then certain main pipes were laid under agreement with the Local Authority; the Company paying the cost of the pipes, and the Local Authority allowing for interest at 10 per cent. on those pipes. The public lamps were put on, and any extra consumers were to be a rebate on the interest. One-third of the charge of a large consumer was to be considered the profit of the Company; and this one-third was to be allowed so far as it amounted to the gross amount of interest on the particular main. The difference last year between the interest on the mains and one-third of the price paid for gas consumed through those mains, was £14 4s. 7d. This sum he reckoned should be added to the annual rent of the cottages £18 0s. 11d., making £32 5s. 6d., which, deducted from the £1657 16s. 8d., gave £1625 11s. 2d. as the maintainable profit. He took as multiplier 26¾ years, because he considered the income of the Company better secured than that of any other non-statutory Company he had met with; there being many houses which did not take gas because there were no mains near them, and others which would take gas if the Company were going to remain. There was, therefore, a very good future for the gas concern. This worked out to £43,348 4s. 5d. The rent of the cottages he capitalized at 22¼ years' purchase (it being customary to value cottage property belonging to a company at a lower number of years' purchase than the undertaking), which produced £405 12s. The interest on mains (£14 4s. 7d.) he capitalized at 10 years—£142 5s. 10d. The late Manager was paid 28s. a week, and had a cottage and gas equal to £10 8s. per annum allowed him. He was permitted to do what work he liked, and practically to be away when he wished. The payment was really in the form of a pension, but some work was obtained from him. When he died, some further assistance would certainly be required, but nothing like the full extent of his wages; and witness therefore claimed that a portion—there being at least half in the form of a pension—would revert to the Company when he died. The Company ought to have the deferred value of this. Taking half his salary (£36 8s.), capitalizing it at 26¾ years' purchase, and deferring it, gave £608 7s. 3d.; and capitalizing the £10 8s. at 22¼ years' purchase, and deferring it, gave £182 13s. 4d. These sums brought the main figure to £44,687 2s. 10d. To this he added £3581 10s. for surplus land, works, and mains—making £48,268 12s. 10d. The 2148 yards of land he put at 2s. 6d. a yard—a price at which land was selling freely in the locality—which equalled £268 10s. The excesses on works he valued as follows: Retort-house £163, one arch in the retort-bench £30, scrubber and washer £136 10s., purifiers £241 10s., gasholders £900, and main-pipes in the streets (half their value of £3684) £1842. Adding to the £48,268 12s. 10d. the usual allowance of 10 per cent. for the purchase being compulsory, made the total £53,095 10s. 1d., which, less the mortgage, produced his final figure of £50,595 10s. 1d.

Cross-examined by Mr. BALFOUR BROWNE: Most of the new supplies were prepayment consumers. The average cost, according to the tables, of repair and maintenance of works and repair and maintenance of mains and services for the past four years was about 9d. per 1000 cubic feet; but nobody would advocate that this was the right figure. In the account year, the maximum day's make and supply was 85,000 cubic feet; in the half year, following the maximum day's make was 95,000 cubic feet. He had calculated the excess on the smaller figure. The Company had no duplicate engine or boiler; in small works duplicate engines and boilers were not needed. Theoretically, there was a deficiency on the condensers; but they did their work. He agreed that in other cases—Chesterfield, for instance,—he had put the repairs and maintenance at 6d.; but the circumstances were very different, the works there being four times as large as was necessary, which would cause the repairs to be heavier. There was an item in the accounts of "gratuities £11 15s., watch and chain presented to the late Manager." This was a present; it was not like an addition to salary. Then there was a donation of £10 10s. to a colliery disaster fund, and £60 honorarium voted to the Directors and Secretary out of undivided profits, for services in connection with the parliamentary proceedings and the extensions at the works. The latter was capital expenditure really. The Directors received no salary. It was apparent by the increase in the consumption that the price of 4s. 2d. per 1000 cubic feet was not exorbitant. It was not a low price. Witness was then cross examined at some length regarding the sum paid the late Manager; it being suggested that the Council were being asked, in respect of the pension, to pay £790 to the Company, not to the man. Witness, however, maintained that the Council were only being asked to pay the Company for profit which they would have if they had not this man on as a pensioner. A certain amount of work was obtained from the man; and therefore the Company considered only half the sum paid him as pension. He agreed that there had been considerable increase in the price of coal.

Mr. *H. E. Jones*, examined by Mr. CRIPPS, said he agreed with Mr. Stevenson that the works were all in good condition. In his valuation, he commenced with the figure of £1577 3s. 11d., taken from Mr. Wood's statement, and, like Mr. Stevenson, added the sum represented by 0·6d. for repairs. A fair and proper allowance here for repairs was 5d. per 1000 cubic feet. The works were working easily. There was a good margin of power; they were in the middle of a district where they could easily get pipes, metal, &c.; and they had not been advancing at such a rapid rate as to throw upon them much of the extra renewal which falls upon many gas undertakings, owing to their rapid growth. The Manager was not entirely a manager, but a handy man, and did the repairs; and he attributed, therefore, half his salary to repairs. Adding these two sums of £35 2s. 9d. and £45 10s., made the figure of £1657 16s. 8d., from which he deducted, as was done by Mr. Stevenson, the two items of £14 4s. 7d. for interest on mains and £18 0s. 11d. rent of cottages—leaving £1625 11s. 2d. In this concern, as in many other small ones, there was a potentiality of earning a considerably larger amount than they did from their ammonia. The ammonia was of equal value with the tar. Hitherto the Company had only been getting ½d. per 1000 cubic feet, or £28 a year, for the ammonia, as against £143 for the tar. This £28 could easily be made £86, or even £130 or £140; but there was to be deducted the interest upon the plant which the Company would have to erect. Therefore, he simply added £58 to the £28. This was the smallest net improvement they could possibly make, if they worked this residual up as they should, and, he thought, they would do. This £58 increased the figure of £1625 11s. 2d. to £1683 11s. 2d., as the maintainable profit. To this sum he applied the multiplier of 28¾ years' purchase; the difference between this figure and the multiplier used by Mr. Stevenson representing the prospective profit which the Company would probably have earned if they had continued. This gave £47,685. He next added four sums of £401 10s. (rent of cottages £18 0s. 11d., at 22¼ years' purchase), £142 5s. 10d. (interest on mains £14 4s. 7d. at 10 years' purchase), £608 (in respect of half pensioner's allowance, and £183 (cottage and gas £10 8s. per annum, at 22¼ years', rebated for eight years' lapse)—making £49,019 15s. 10d. The surplus works and land he took at £3949 reverting within five years, which, on the 3½ per cent. table, equalled £3581—making £52,600 15s. 10d. His estimate of the surplus land was £362 10s.; the area he took being 2898 yards. Besides the unused plot just by the works, there was a large amount of space on the original works available for extensions. In respect of the works in excess, he allowed the following sums: Retorts £221, scrubbers £160, purifiers £216, gasholders £843, and mains and pipes £1842. At the present rate of increase, this plant would be employed for the most part in five years; and therefore he took the deferred value for it of 2½ years. To the £52,600 15s. 10d. he added the usual 10 per cent., making £57,860 15s. 10d., which, less the mortgage of £2500, gave his final figure of £55,360 15s. 10d.

Cross-examined by Mr. BALFOUR BROWNE: The £58 for the ammonia worked out to £1680 when capitalized. For coal, the Company were paying 1s. 6d. per ton in 1898 over 1897, and 1s. 8d. per ton in 1899 over 1897. In the present year, Tyne coal was advancing about 8s. per ton; and other contracts in the Midlands had advanced 5s. per ton. The Company could raise the price of their gas, though he agreed that a low charge stimulated consumption.

Friday, April 20.

Mr. *Jones*, re-called, made an adjustment of his figures, which altered the total from £55,360 to £54,763.

Mr. CORBET WOODALL: With regard to the ammonia, what you ask is that the Company, not having erected this plant, shall inherit the work of other men who come in and do it?

Witness: No; you have cut the Company off from doing that which anyone would advise them to do next year.

This concluded the case for the Company.

Mr. Balfour Browne, in opening for the Council, said there was a startling difference in the valuations; the figures on one side being about £54,000, and on the other £23,000. The chief question was: What was the maintainable income of the Company? All the circumstances must be looked at, and not merely the income in a particular account year. It was quite evident the Company were taking the benefit of accidental circumstances which had swelled the income of 1899, for the profit of the concern rose from £954 in 1896 to £1577 in 1899. The way to get rid of difficulties of this sort was to take an average, which would be £1099; and this, after proper corrections had been made, was nearer the maintainable income than £1577. The fortuitous circumstance in 1899 was the cost of coal, which was practically the same as in the previous year—viz., 11s. 2d. per ton. This was an accident, and could not continue; and it meant that their income in the account year, if the ordinary price had been paid, would have been reduced by about £400. Then the Company adopted an extraordinary position with regard to maintenance of mains, works, and services. The facts showed that 9d. per 1000 cubic feet was the right amount to charge; this being the average of the last four years. But they were asking the Umpire to accept the figure of the account year, when, owing to the large outlay of 1898, they were able to expend very little. The 10-inch main had nothing to do with the matter, because all the improvement of that main being laid was charged to capital. Counsel declined to go into the minute adjustments made by the Company's witnesses; holding that there was the best proof that the figure for maintenance was 9d. Turning to the valuations put in, he referred to the interest on mains £14 4s. 7d.; pointing out that the payment would cease when the Company had sufficient consumers on these mains to pay them this sum; and those consumers, according to the Company, they could secure to-day. It was wrong, however, to multiply it by 10 years, because there was no 10 years' life in it; the figures should certainly be less. Then capitalizing even the net rent of the cottages at 22½ years' purchase, was ridiculous. As to the ingenious theory of Mr. Jones with regard to the ammonia, there was no calculation in it. It was nowhere except in Mr. Jones's imagination. He allowed £1680 for something the Company had never done and never would do. This £1680 should be absolutely ignored. Having arrived at the income, the important question arose of the multiplier, which had reference to the security. Counsel differed entirely from Mr. Stevenson, who said that this was one of the best-secured companies he knew. A company who were charging up to the hilt for gas were not secure. The whole meaning of the purchase was the complaints of the excessive price. So excessive was the price, that the Local Authority had had to light portions of the district with oil; and Messrs. Stableford and Co., who consumed 2½ million cubic feet of gas, had threatened that, if the price were not reduced, they would instal the electric light. Probably, he agreed, the Council would have to pay off the old Manager; and in that case they would have to compensate him on the basis of the salary he received. But the Company were asking £900, because they said they might have saved this man's wages. If this sort of criticism was to be allowed, all the working expenses also should have been criticized. The thing was nonsense. If the Company were to be allowed to go into these minute matters, and say they divided this old gentleman into two, and that the Council where to repay the Company half his salary, because he was not worth it, they might do exactly the same with regard to every other servant they had. Then the Act said the Arbitrator should not have regard to the fact that the Company were incorporated by Act of Parliament. To the Company this made a serious difference, which should be represented by at least 5 years' purchase. The Company had an Act in 1898; and they were to be under all the rules and regulations in the General Act with regard to sliding-scale, limitation of dividend, &c. The total amount they could have divided if they had continued to exist was £900; yet they talked about the immense future there was before them. It was absolutely ridiculous to say the Company must be treated as in a position to charge anything they liked. Having regard to all these facts, he held that the Company were not well secured, and that a liberal multiplier would be between 22 and 23 years. There was an entire difference of opinion as to the amount of surplus works. Mr. Stevenson calculated that the maximum daily output and sale was 85,000 cubic feet; but in December, 1899, they were selling 95,000 feet, and this would materially affect Mr. Stevenson's calculations. The claim in regard to mains was unique. For their own purposes, they had laid some mains which were too large. It was much cheaper to do this than to lay a small one and replace it with a larger one as required. No company would do such a thing; but this was the first time he had heard of people measuring up the mains, and saying: "Because this is a little too big, and would hold a little more gas, we should be allowed for it." Mr. Chester held that some of the works were seriously deficient, which showed that these matters were open to criticism. As to the 10 per cent. allowance for compulsory sale, he pointed out that on Mr. Jones's figures it amounted to £5200. This was claimed because the Company had been, in the public interest, compelled by Parliament to part with their property for an equivalent in money. He denied that, because there was compulsion, they were entitled to a penny. This would be making the Coalville ratepayer pay for what Parliament had done. At the same time, if the Company suffered any loss beyond what was included in the real value, this loss should be compensated for. The only thing he could suggest for which any allowance should be made was the cost of re-investment—perhaps 1 per cent.

Mr. *W. R. Chester*, examined by Mr. Ram, said the gas-works at Whitwick were not in a good position for the supply of gas; being on top of a hill, and remote from a railway station, which meant additional cost for the cartage of coal and for the removal of residuals. The buildings and apparatus were in a fair state of repair. Generally, the whole of the plant was being worked at its maximum capacity. On one day in the year 1899, the maximum daily make and output was 95,000 cubic feet. During the past winter, the whole of the retorts were under fire; and there was absolutely no standby. There was a surplus arch in which retorts could be placed; but there were no retorts set. Even if six retorts were placed here, there would be no surplus power whatever. The condensers were deficient, even for the present make; and on the 95,000 cubic feet basis, they would be much more deficient than Mr. Stevenson's figure of 25 per cent. Then in works of this size there ought to be a duplicate boiler and exhauster. There was, too, not more than enough engine power. The Livesey washer of 5000 cubic feet capacity per hour was just equal to the present production. Of the two scrubbers, only one could be regarded as a scrubber in the proper sense; and this was just equal to requirements. The four purifiers were about 13 per cent. in excess; the station meter was just equal to the present demand; the gasholders were deficient in the proportion of 84 to 95, or 12 per cent.; and the tar and liquor storage-tank was about equal to the present output. He handed in a valuation of surplus and deficient works on the basis of a daily output of 95,000 cubic feet, which showed surplus in land of £200, and in purifiers of £60; and deficiencies in condensers of £20, steam-boiler (duplicate) £50, engine and exhauster £150, and gasholders £330—a total of £550. This left a net deficiency to be deducted from the capitalized value of the undertaking of £290. The rent of the cottages in his valuation he treated as part of the income. The mains and meters were about the usual size for a works of this description. The 10-inch main recently laid from the works into Coalville—the centre of the largest consumption—had no surplus whatever. It was such a main as a prudent person would lay in taking up a small one for the supply of a town like Coalville. In the past ten years, private consumption had doubled, and the public lighting trebled. There had been a very large increase in the consumption of the four or five largest consumers, who took 45 per cent. of the whole production. If any of those consumers were to substitute electricity for gas, it would be very serious for the Company. In his valuation, he started with the figure of £1577 3s. 11d., balance of net profit as brought out by the Accountants, from which he deducted interest on debentures and temporary loans £101 5s. 6d.—leaving £1475 18s. 5d. It appeared that during the past three years no Directors' fees as such had been paid; but there had been honorariums and gold watches given, and things of that kind. It was unusual to have no Directors' fees; and no doubt these honorariums had been paid as recompense for the services of the Directors. The usual fees of Directors ranged from ¼d. to 1½d. per 1000 cubic feet; and in this case he took ½d. as a reasonable figure, it being also the average of what had been paid the Directors in one form or another in the last three years. This produced something like £30 a year, and reduced the main figure to £1445 12s. 5d. The large income of £1500 in 1899 was due to the low price the Company paid for coal, and to the increased value of residuals in the same year. They paid nothing extra for the coal, but reaped the full benefit of the increase from 6s. 9d. to 8s. 5d. in the price of coke. The increase in the price of coal and coke since the account year he took as 6s. 6d. per ton in each case; but as a ton of coal only produced about 5 cwt. of coke, the increase on coke was equal to 1s. 4d. per ton of coal carbonized. The net result was that there was an increase of roundly 5s. a ton which would have to be paid for coal; and this, on 1563 tons, equalled £390 15s. Subtracting this from the £1445 12s. 5d., left £1055 3s. 5d. During the year, there was a total expenditure for works, mains, and meters of 5·81d. per 1000 cubic feet. The proper figure should be 6d., which he felt was abundantly justified by the fact that 9d. had been the actual figure for four years. This meant a further deduction of £11 2s. 6d., which left the net maintainable income £1044 0s. 11d. This (the security not being particularly good) he capitalized on the 4½ per cent. table, or 22⅞ years' purchase, which gave £23,201, or, less £290, the amount of the deficiency in works, £22,911, to which had to be added the costs of obtaining the Act of 1898, the winding-up expenses of the Company, and the value of the stocks at date of transfer.

Cross-examined by Mr. Cripps: He allowed Directors' fees, because there was evidence that such had been paid, though not in the form of fees. If the works were continued, he had no doubt a sum would be set aside for Directors' fees; and it was only reasonable that provision should be made for that. A rise in the price of coal should be capitalized, providing there was no possibility of raising the price of gas to correspond. As a non-statutory concern, there would be no objection to the Company raising the charge for gas to meet any rise in the price of coal; but there was a very strong commercial objection. They were already charging a higher price than any other company of like size in the three counties of Nottingham, Derby, and Leicester—practically they were charging the commercial limit. The price was 4s. 2d. per 1000 cubic feet; and up to 1896, it was 4s. 7d. Other residuals, besides coke, had not risen. The difference in the number of years' purchase of a statutory and of a non-statutory company would be about five; but much would depend on the particular company. An exceptionally well-secured statutory company was worth over 30 years' purchase. The maximum day's make of 95,000 cubic feet was after the period for which the accounts ran. In the period covered by the accounts, the maximum was 85,000 cubic feet; and if this were taken, it would slightly alter his deficiency figures—perhaps wipe off the £290. The land was distinctly surplus.

Mr. *Jonathan Longbotham*, a Director of the Ruabon Coal and Coke Company, of the Wharncliffe Silkstone Colliery Company, and of the Tinsley Park Colliery Company, said there had been an advance of 2s. per ton on contracts terminating on June 30, 1900, as against those terminating on June 30, 1898. He found that the Whitwick Gas Company in 1899 paid slightly less than in 1898. This would account for a larger profit than would be otherwise possible. As to the future, with regard to the contracts for the next twelve months, they would be made at an advance of 5s. per ton on last year's prices—an advance of 7s. per ton altogether since 1898. This referred to the Midland district. As to Durham, Mr. Jones had stated that his prices were 8s. per ton more this year than last. The amount obtained by the Company for coke had, of course, risen considerably; but assuming that the advance in the price of coal would be 7s. per ton on the figure paid in 1897, it would not be possible for the Company to be compensated for the increased price of coal by any advance in the value of coke. It required an advance of 3s. 7½d. per ton on the coke to compensate for 1s. advance in coal. In his opinion, it was impossible for the Company to continue working on anything like the basis of cheap coal that they had done.

Mr. *T. H. Heward*, Manager of the Nailstone Colliery, and Chairman of the Coalville Urban District Council, corroborated the previous evidence as to the rise in the price of coal since 1897, which he put at a minimum of 5s. per ton. Messrs. Stableford had stated that they contemplated adopting the electric light. At the present time, a private residence and a factory were lit by electricity.

Mr. *L. L. Baldwin*, Surveyor to the Coalville Urban District Council, stated that in Jackson Street, in the centre of Coalville, oil was used in the public lamps, though the gas-mains were quite close, because they

considered oil was more economical and gave better results than the gas-lamps.

Mr. Balfour Browne, in briefly summing up the case for the District Council, said that, in his opinion, Mr. Chester's deduction of 6d. per 1000 cubic feet for maintenance and repairs was too little; but he thought it was to be accounted for by the fact that gentlemen like Mr. Chester had given evidence on other sides, and they wanted—which was a damnable heresy—to be consistent. In the case of this particular Company, the average of the four account years was 9d. In these things there was no real necessity for consistency, because each case ought to be tried on its own merits. He thought that 22½ or 22⅝ years' purchase was a fair multiplier in this particular instance.

Mr. Cripps said he sympathized with his friend in trying to get what he called "damnable heresies" out of the mind of the only expert witness whom he had called. Mr. Chester threw him overboard altogether in regard to the four years' average, and had rightly done as was done in all these cases—particularly where there was a concern with a rising income. He had taken the figures for the last year. In regard to the coal question, it was utterly inconceivable that anyone, from a business point of view, when making an estimate the value of a concern of this kind, would base its value upon the supposition that some particular article which happened to be abnormally high, would remain at that abnormal height for all time; and therefore Mr. Chester's deduction under this head of £390 15s. was wrong. Again, with regard to maintenance and repairs, Mr. Balfour Browne had been entirely let down by Mr. Chester, who absolutely agreed with Mr. Stevenson on this point. As to Messrs. Stableford not continuing to take gas, Mr. Stableford was a member of the District Council; and if there had been anything in it, he would have come up and given evidence to that effect. Mr. Chester's deduction for Directors' fees was wholly inadmissible. The work had been done by local gentlemen without payment, which was a very common thing in these concerns; and therefore this fictitious sum of £30 ought not to be deducted. In regard to the multiplier, 22⅝ years' purchase was too low. Mr. Chester had admitted that, in the case of one or two statutory companies, he had given 30·77 years' purchase, and had said he would make a difference of 5 years between a statutory and a non-statutory concern. This would make Mr. Chester's figure really 25·77 – roughly 26 years—whereas the Company were asking 26⅜ years. In regard to Mr. Chester's deficiency of £290, this was based on a maximum of 95,000 cubic feet; whereas the account year showed a maximum of only 85,000 cubic feet, and there was not the slightest evidence of any deficiency in 1899. In regard to the 10 per cent., he thought Mr. Chester had been coerced by Mr. Balfour Browne into omitting it. But the Act showed that this was a compulsory purchase under the Lands Clauses Act; and this implied the 10 per cent., which had been allowed in other cases. The half wages of the Manager, he admitted, was a far more controversial point. There was a good deal to be said for the way in which Mr. Balfour Browne had dealt with that £45 10s. But it was obvious that in this case the Manager was the handy man who did many of the repairs; and therefore the half of his wages really came under the head of repairs. At the present time, there was an elderly gentleman doing his work in a very easy style; and what they said was that the work could be done for half what they paid him, and that they only ought to make the allowance for the actuarial calculation as to the probable term of his life. This, he considered, was a perfectly right way of doing it. After alluding to the question of the surplus land, works, and mains, the learned Counsel dealt with the outlook of the Company. The future prospects were exceedingly good. There was an enormously growing district, a great deal of which had not been developed as regarded gas consumption. There was no doubt they had a very prosperous area as regarded the future extension of the gas concern. As to the security of the revenue, the real essence of security was the certainty of a growing market in the future; and there was no doubt that, as the price of coal went up, their district, being a coal-producing area, would have increasing prosperity. There was another matter which was not technically before the Umpire at that moment, but which be hoped could be agreed upon and inserted in the award.

The Umpire: That is the matter as to the three items of the cost of the Act, the winding up, and the compensation to officers.

Mr. Cripps: Yes; I see no reason why all three might not be fairly adjusted.

Mr. Ram: It may well be that we can agree; but if we fail, then I would ask, not that this matter should be excepted from your arbitration at all, but that, by consent, if not by the words of the clause, it should be put within your decision, and it may come before you to decide that point.

The Umpire: Very good.

Mr. Cripps: Speaking without instructions, I think Mr. Ram's suggestion is so reasonable that it ought to be accepted—that is to say, if we cannot agree upon these matters, whatever your technical powers may be, we may make another appointment, and give you the powers to deal with the whole question.

Mr. Lloyd said as, according to the Act, the transfer had to take place at the expiration of the first half year after the award, they would like to have the award as early before June 30 as they could get it. It would be unfortunate if they had to go on to Dec. 31.

Mr. Ram said they wished to take the undertaking over before June 30.

The Umpire said, if they would do what they could to bring their labours to an end as regarded the three items, the Arbitrators would not delay them many days.

The proceedings then terminated.

Luton Gas Company.—Striking progress was shown at the 84th ordinary general meeting of the Luton Gas Company, recently held under the presidency of Mr. J. Blundell. The number of consumers, according to the report, had increased by 430; while 300 new stoves had been added, and the use of gas for motive power extended. During the year, several of the mains had been increased in size, and the further large demand for gas, owing to the extension of the town, made it necessary to put up more producing plant, and increase the storage by the erection of another gasholder. Though coal had considerably increased in cost, the Company had not found it necessary to make any extra charge to the consumers; the present low rates of 2s. 5d. to the public and 2s. 3d. to the Corporation for street lighting being maintained.

METROPOLIS GAS SUPPLY.

Dr. A. W. Williamson's Quarterly Report.

The following is an extract from the report of Dr. A. W. Williamson, F.R.S., the Chief Gas Examiner for the Metropolis, on the quality of the gas supplied to London during the quarter ending the 31st ult.

Illuminating Power.—The maximum, minimum, and average illuminating power, in standard sperm candles, at each of the testing-stations, were as follows:—

	Max.	Min.	Aver.
Gaslight and Coke Company—			
Kinghorn Street, Cloth Fair, E.C.	17·2	16·1	16·5
Dorset Buildings, Salisbury Sq., E.C.	17·0	16·0	16·4
Millbank Street, S.W.	17·4	16·3	16·7
Ladbroke Grove, W.	16·9	16·1	16·4
Vincent Terrace, N.	18·1	16·1	17·0
Carlyle Square, S.W.	17·0	15·7	16·3
Camden Street, N.W.	16·7	16·0	16·2
Graham Road, Dalston	18·9	16·4	17·5
Kingsland Road, N.E.	18·1	16·2	16·9
Lambeth Road, S.E.	17·4	16·0	16·3
Hornsey Road, N.	17·4	16·0	16·4
Commercial Gas Company—			
Wellclose Square, E.	17·1	16·0	16·4
Parnell Road, Old Ford	17·0	16·7	16·8
South Metropolitan Gas Company—			
Hill Street, Peckham, S.E.	18·1	15·7	16·8
Bedford Road, Clapham, S.W.	17·3	16·0	16·5
Stoney Lane, Tooley Street, S.E.	17·3	16·1	16·6
Lewisham Road, S.E.	17·0	16·0	16·4
Blackfriars Road, S.E.	17·4	16·0	16·5
Burrage Road, S.E.	17·2	16·1	16·5

It will be seen from these results that the average illuminating power of the gas during the quarter at all the testing-stations was higher than the parliamentary standard. Slight deficiency was reported in the gas testing at the Carlyle Square station of the Gaslight and Coke Company, and the Hill Street station of the South Metropolitan Gas Company.

Purity.—Sulphuretted hydrogen was not reported to have been present in the gas. The average amount of sulphur in other forms than this was considerably less than the quantity permitted—viz., 22 grains—which was only exceeded on two occasions during the quarter. Ammonia was generally present in the gas throughout the quarter, but only in slight quantities. The limit allowed was not exceeded on any occasion.

MANCHESTER CORPORATION GAS AND ELECTRICITY DEPARTMENTS.

The Estimates for the Current Year.

A Special Meeting of the Gas Committee of the Manchester Corporation was held last Wednesday for the discussion and adoption of the estimates of income and expenditure for the current year, which ends in March next. The Committee have, in the past, been able to considerably lighten the city rates by their contributions out of the profits of the department; and last year the sum of about £50,000 was paid over to the City Treasurer in this way. This year, however, the Committee do not anticipate being able to hand over anything approaching the amount that was at their disposal last year towards the relief of the rates; the estimate being, we understand, about £20,000—representing a reduction of £30,000 upon the previous year. No actual details of the estimate will be available for publication until the end of the present week; but several items are mentioned as accountable for the probable reduction in the profits of the Gas Department, the chief of these being the large advance in the price of gas coal, and the increase in the wages bill, in accordance with resolutions recently adopted. We understand that the Committee have allowed in their estimates for a rise in the price of coal, but not to the extent of the advance for which colliery owners in some cases intend to hold out. Of course, any large increase in the cost of coal would mean an advance in the price of gas. The Committee are not yet on the market for gas coal; but tenders are being received for tar.

The Electricity Committee of the Corporation, who also held a meeting the same day to consider their estimates for the current twelve months, and who last year contributed £10,000 in relief of the rates, do not anticipate that they will this year be in a position to hand over anything to the City Treasurer. In fact, it is stated that the Committee contemplate having to draw upon their reserve fund to the extent of £23,000. Among the causes assigned for the probable diminution of profit are the interest that will have to be provided on capital expenditure incurred in extending the system in the outskirts and beyond the boundaries of the city, the cost of repairing damages caused by street explosions, and the expenditure for relaying the mains.

ST. HELENS CORPORATION GAS SUPPLY.

The Past Year's Working.

The report presented at the last meeting of the St. Helens Corporation Gas and Lighting Committee, by the Engineer and Manager (Mr. S. Glover), shows a continuation of the healthy growth which has characterized the undertaking for many years. During the twelve months ending the 31st ult., 574 additional cooking-ovens and grillers were fixed, making a total of 2011; 175 additional boiling-burners, making a total of 593; and 307 heating-stoves, making a total of 1271—bringing up to 3875 the total of cooking and heating arrangements in use at the end of the year. There were 45 additional ordinary meters fixed, making a total of 3652; and 576 automatic meters, making a total of 4016—bringing up the total of consumers' meters to 7668. The cash collected for the year from the automatic meters totalled to £7135 1s. 7d., being equal to 1,736,000 pence, and a weight of 15½ tons. The amount collected in the year 1899 was £5236 12s. 1d.; making the increase for the present year £1898 9s. 6d. The quantity of gas made in the year was 327,332,100 cubic feet, as compared with 298,062,600 cubic feet in 1899; being an

increase of 29,269,500 cubic feet, or equal to 9·82 per cent. Its illuminating power was 19·12 candles, as shown by 293 tests, against 19·11 candles in 1899. With regard to its quality, the quantity of sulphur in other forms than sulphuretted hydrogen was 7·9 grains, and of ammonia 0·5 grain, per 100 cubic feet, according to the Referees' test; and no carbonic acid or sulphuretted hydrogen was present. Instructions have been given to the Engineer confirming his proposals for the provision of new works to meet future requirements.

HORBURY AND THE OSSETT GAS UNDERTAKING.

Satisfaction with the Agreement.

At the last ordinary meeting of the Horbury District Council, Mr. Thornton, in proposing a vote of thanks to the Chairman (Mr. Sykes), prior to the reconstitution of the Council, referred to the position of Horbury under the provisions of the Ossett Corporation Gas Bill. He remarked that the gas question had been difficult to deal with; but they had thrashed out the matter, and they thought their proceedings had resulted in an agreement being arrived at which was second to none which had ever been secured by any local authority, and which placed the Horbury Council in a prominent and proud position. In regard to the agreement, he might say that, on the very face of it it seemed rather strange that a Local Authority who found no management and no capital, and who ran no risk, were about to participate for the first time in the profits derived by the Corporation of Ossett from the gas-works when they had bought the works from the Gas Company. In London this was regarded as something unique, and altogether an innovation in connection with questions of this sort. Perhaps it might be strange to look at the matter in that light; but still it was the fact that they were about to receive their share of the profits from the gas-works. He was quite sure that when their Ossett friends—many of whom were now finding fault with the Council for the good bargain they had made—knew the whole of the facts, they would not look upon the matter as so strange, because he was persuaded that Horbury had hitherto been the profit-making machine of the Ossett Gas Company, and would no doubt be the profit-making machine of the Gas Department of the Ossett Corporation. Their differences in respect to the mileage of the gas-mains, the consumption of gas, and many other things, had led him to believe that what he had just said about profit-making was strictly true; and he was of opinion that the figures would bear out the statement he had made. The Council had come to an agreement with Ossett on this matter; and it was for the future members of the Council to see that all the details which it had taken the Horbury Council so long to settle were carried out in their entirety. If this were done, he was quite sure that in ten or twenty years' time the ratepayers of Horbury would say the Council did well in securing such an agreement. The Chairman, in acknowledging the vote, said some of the meetings on the gas question were stormy, and others breezy; but he was pleased to say that out of it all they had got an agreement of which he felt proud, and he hoped they all did. He was confident that the more the ratepayers came to understand it, the better they would like it; not because they had gained any real advantage over their neighbours at Ossett, because they had obtained nothing but what was fair, right, and just. He hoped the agreement would last, not twenty years, but to the end of the full term of forty-five years. Most of those present would no doubt then be dead; but their children and children's children would have cause to rejoice over the agreement. They owed a lot to Mr. Barker, their Clerk, for it. To his credit it should be said that he drew the first rough draft of the agreement, which would practically be a model for all future time for the settlement of questions of this kind. The fact was it had already been adopted as a precedent; and therefore their Clerk could take to himself a little flattery for having picked up the fragments of their discussions, and put them into shape.

Sales of Shares.—Last Wednesday, Mr. Frank Amos offered for sale, in pursuance of instructions received from the Directors, £1000 of "A" stock of the Canterbury Gas and Water Company. It was put up in £10 lots, which were quickly disposed of at from £22 10s. to £22 15s. per lot—the average being £22 12s. 6d. On the same day, Mr. C. Stidolph sold £1500 of new £10 shares (7 per cent.) in the Faversham Water Company, at rather more than £17 apiece. On Thursday, Messrs. Tootell and Sons disposed of two lots of £50 of consolidated stock of the Maidstone Gas Company, carrying a dividend of 11 per cent., at £117 each. A lot of £25 of similar stock realized £58.

Additional Water Storage for Heywood and Middleton.—The Heywood and Middleton Water Board have instructed their Engineer (Mr. J. Diggle) to prepare plans and estimates for a proposed new reservoir to be constructed on Ashworth Moor. This is part of what has been known as the Ashworth Moor additional water scheme, originally sanctioned by Parliament in 1877. Since that time, two Acts have been obtained—one in 1889, the other in 1898—for the purpose of extending the period allowed for the execution of the work. Under the Act of 1898, the scheme must be carried out before 1906; and it is feared that Parliament will not grant any further extension. An unusually prolonged spell of fine weather last summer caused the millowners on the Naden Brook to be temporarily deprived of their water rights; and on account of this the Board have had to pay £200 for compensation.

The "Builder" on the London Gas Question.—Referring to the recent parliamentary proceedings on the Bill of the London County Council to legalize the portable photometer, the "Builder" last Friday said: "The general drift of the evidence has been to the effect that the Gas Companies supply 16-candle gas to the testing-stations, but not to every consumer in every part of their districts, and that it is their duty to supply every consumer (save when connected to a dead-end main) with 16-candle gas without regard to cost; while the Gas Companies assert that such a requisition would necessitate the supply from the works of 18½-candle gas, and that even then there would be constant risk of default. In view of the admitted deterioration of gas under certain conditions of supply, the question for the consumer appears to resolve itself into this: Is it better to pay for 16-candle gas and obtain 14-candle, or to pay for 18½-candle gas and get 16-candle? We consider the former to be the lesser of the two evils."

THE COAL FAMINE AND THE PUBLIC.

"The Times" last Thursday contained a long article on the above subject from a correspondent. In view of the great interest which just now attaches to the general question of the coal supply, we reproduce the communication practically in its entirety.

Having, at one time or another, visited and examined the principal coalfields of the United States, Germany, France, Belgium, Bohemia, and Hungary, as well as those of the United Kingdom, and having given to the economic conditions of the coal industry a large amount of my attention for more than a quarter-of-a-century, I have naturally been struck by the very exceptional character of the recent and existing situation in the coal industry. The most prominent feature of that situation is the world-wide demand for increased supplies, and the consequent efforts that are being made, in all coal-producing countries alike, to bring the supplies abreast of the extraordinary demand. No country on the face of the earth is now in possession of as cheap supplies of fuel as formerly. In the great majority of cases, the last twelve months have witnessed advances of price ranging from 10 to 100 per cent.; but, whether it be China, Japan, Australasia, Continental Europe, North America, or Great Britain, higher values for fuel have everywhere prevailed.

The proximate causes of the recent scarcity and present high cost of fuel all over the world are, in my opinion, the following:—

1.—The increase in the make of iron and steel, which has increased the consumption of fuel within the three years ended with 1899 by probably quite 40 millions of tons.
2.—The increased requirements of the world's railways, which, within the same period, have had to face an enormous increase of business, involving a corresponding increase of coal consumption.
3.—The growth of the world's mercantile marine, responding to the increase of commercial operations, which probably represents an increase of 15 to 20 per cent. on any former period; and a similarly larger demand for coal.
4.—The almost unequalled prosperity of all manufacturing industries, and the demands thereby entailed on coal-producing nations.
5.—The more general diffusion of wealth, and the greater prosperity of whole communities, which have led to a larger consumption of coal for domestic and other purposes.

A very perfunctory examination of this analysis of causes is sufficient to show that they are of world-wide application, although, no doubt, in some countries they will be much more generally active than in others. One of the oldest writers on the principles of political economy has written that all the world, as to trade, is like a single nation. If this remark applies with special emphasis to any particular trade, it must be the trade in coal, for British coal is now supplied, to the extent of over 50 million tons a year, to almost every country in the world; and any rise of cost at the pit or increase in the rates of freight is at once felt by the remotest markets. If it be true that misery likes company, then the coal consumers at home may derive satisfaction from the knowledge that the burden of dearer fuel has equally to be borne, with perhaps less apparent chance of relief, by all other consumers, even in the remotest corners of the earth.

But the threatened coal famine has another unique feature, in following as it does a period of the greatest expansion of mineral, and especially of coal, resources that has ever been known. The extent of this expansion may be estimated from the following comparison:—

Quantities of Coal Raised in the Principal Coal-Producing Countries in 1869 and in 1899.

Country.	1869.		1899.*
United Kingdom	102,948,000	..	220,000,000
United States	28,258,000	..	205,000,000
Germany†	25,704,000	..	130,000,000
France†	13,330,000	..	35,000,000
Belgium	12,298,000	..	24,000,000
Austria†	3,600,000	..	15,000,000
Russia	510,000	..	13,000,000
Colonies and India	750,000	..	15,000,000
Japan and other countries	500,000	..	6,000,000
Totals	187,898,000	..	663,000,000

* The figures for 1899 are mostly estimated, but within very narrow margins of error, taking the world's output as a whole.

† The figures recorded for these countries include considerable quantities of lignite and brown coal.

Within the same period, the consumption of petroleum and natural gas for calorific uses has made corresponding progress, equal, approximately, to an addition of at least another 50 or 60 million tons to the annual fuel resources of the world. From this table it appears that during the 30 years ended 1899 the fuel (coal) output of the world increased by 475 millions of tons, or 252 per cent. The curious thing is that, despite the enormous advance, the demand for coal in 1899 was greater, and the apparent danger of a coal famine more real, than at any former period, excepting in the years 1873-74. Let us further see to what this enormous increase in the world's consumption of coal is mainly due.

In the first place, as already stated, there can be little doubt that it is attributable to the increased demands of the world's industrial operations, and more especially of the iron industry. Since 1869, the world's output of pig iron has risen from about 10 million tons to over 40 millions. This alone would mean an increased consumption of coal, as coal, to the extent of between 45 and 50 million tons. But in working up this pig iron into manufactures—rails, plates, structural iron and steel, wire, cutlery, tools, and implements and machinery—probably a further 100 million tons of fuel would be consumed; so that over 30 per cent. of the total increase is directly attributable to the iron trade and collateral industries.

In the next place, as we have seen, transportation in its various forms is responsible for a great part of the increase. The shipping trade of Great Britain alone absorbs nearly 20 million tons of fuel annually. That of the world at large will probably consume three times this quantity; and, after due allowance has been made for the improvements which have enabled steamers to be worked with quite one-half of their former consumption of coal, the vast increase in the relative proportion

of steam tonnage, and in the work done by that tonnage, will in all probability have called for nearly twice the quantity of fuel consumed by the mercantile marine of thirty years ago. In other words, if the world's coal consumption under this head is now 60 million tons a year, this is likely to be 30 million tons more than the quantity consumed in 1869. We know definitely that, in the case of the United Kingdom, the increased consumption in the interval has exceeded 100 per cent.

The coal consumption on railways is a very large and increasing item. On the 25,000 miles of line constructed in Great Britain, the annual coal consumption is now computed at about 10 million tons. There are at present more than 465,000 miles of railways in operation throughout the world; and, if they are assumed to average the ascertained British consumption of fuel, the total consumption of coal in railway operations would be something like 180 million tons a year. From this figure, however, very large deductions have to be made in respect of lines with little traffic and lines that burn other sorts of fuel, such as wood and petroleum; so that, on the whole, the railway consumption of coal fuel will probably be quite 50 million tons under the figure obtained by adopting British practice as a basis. Even so, however, the total coal consumed on the world's railways would come out at 130 million tons, and of this quantity probably one-half has been added during the period under review.

We have now accounted for 245 million tons, or upwards of 50 per cent., of the total increase in the world's consumption of coal during the last thirty years. As with the iron industry, so with general manufactures. As with steam shipping and railways, so with domestic requirements, the gas industry, naval needs, and the many other elements that make up the sum-total of the uses of fuel. During these thirty years, the world's population has increased enormously—probably to the extent of quite 200 millions; and this alone would represent a vast coal consumption, if the general home consumption of coal-using countries be taken at even one-fourth the British standard, which is 3·8 tons per head per annum.

When one examines the main causes of the increase of coal consumption in the past, it is at once apparent that the phenomena producing the results in question are of a more or less permanent character. Hence the increase in the consumption of coal is likely to continue in the future, although whether in a diminishing or in an accelerated ratio no one can with confidence predict. Railways will continue to be built, commerce will continue to extend, iron and steel—the handmaidens of material civilization—will be produced in larger quantities, population will continue to grow all over the world, and the demand for more coal will follow.

We may now proceed, with advantage, to discuss the special circumstances of the coal trade situation, so far as the United Kingdom is concerned. That situation has a number of distinguishing and characteristic features. Perhaps the most prominent of these is the enormous extent of our export trade, which is more than three times as great as that of Germany, the next most important coal-exporting nation, and fifteen times as much as that of the United States, which is the next largest coal-producing nation after our own. Another distinguishing feature of the British coal industry is that our supplies are in many directions threatened with relatively near exhaustion. In Lanarkshire—the most important of the coalfields of Scotland, and the one, of all others, on which the great manufacturing industry of Glasgow mainly depends—in South Staffordshire, in the Forest of Dean, in some parts of Durham and Northumberland, and elsewhere, the available supplies of coal are being so rapidly depleted that more or less serious exhaustion will have to be faced within the next twenty, and in some cases, as in that of the cheap coal of Lanarkshire, within the next ten years.

What is the very lowest figure at which coal can be worked and sold in the United Kingdom? The Home Office records show that within the last twelve years the average estimated value of the total British coal output was only 5s. per ton; while the average official value of the coal output of Scotland was only 3s. 11d. per ton. This latter figure compares not unfavourably with the low selling prices recorded for the United States, and is decidedly under the average prices hitherto recorded for any country in Continental Europe. But it is not by any means certain that the coal extracted from the mines of Great Britain was produced for these prices, even if they were the average selling quotations. It has happened again and again that large quantities of coal have been produced in British coalfields over long periods with no profit at all, and even at a loss. This process, of course, could not go on for an indefinite period—indeed, the exceptionally low figures of 1888 were improved to the extent of about 1s. 3d. per ton in the following year; so that probably, on an average of the two years, the results were not entirely unsatisfactory. But about this time we began to hear a good deal of the theory of the "living wage;" and this movement brought about an advance in the cost of labour which has continued ever since, and is likely to be more or less permanent. Throughout the federated districts of Yorkshire, Lancashire, Derbyshire, &c., the wages paid have since 1889 been from 30 to 45 per cent. higher than those paid in 1888; and until, and unless, we resumed the rates of wages paid in that year, the production of coal at equally low rates would be practically impossible. Indeed, no one appears to anticipate that the general range of coal prices in the United Kingdom will ever again be so low as it has been. Cheap coal is not a function of low wages alone. It depends also on other conditions, such as comparatively virgin mines, shallow depths, thick and easily-worked seams, and other features that are becoming less and less prominent, and in some parts of Great Britain are entirely disappearing.

The average increase of value in the coal trade of Great Britain over the year 1899 is difficult to compute. In some descriptions of coal it has been much more considerable than in others. It has perhaps been greatest of all, strangely enough, in what are ordinarily regarded as the most worthless varieties—viz., smudge or "duff"—which in some previous years have been sold at 1s. per ton, or even less, but which within the last few months have sold in large quantities for 5s. to 6s. 6d. per ton, according to the locality and the purposes to which it was to be applied. A very good test of the difference of value is that supplied by the coal export returns. If we go back to the four years ended 1888, we find that the average declared value of our coal exports in that period was only 8s. 5d. per ton. In the four years ended 1898 the average was about 9s. 3d. per ton. But for the last six months the average declared value was not less than 13s. 6d. per ton, which is an advance of 4s. 3d. on the average of the corresponding exports for the four years ended in 1898. I believe that, so far as our coal export trade is concerned, this is about an adequate and accurate measure of the true difference between then and now. But that difference has not up to the present time prevailed for a longer period than about six months; and if we go back to this time last year, before the very decided rise of prices began, we find that the coal exports are returned by the Board of Trade at an average value of less than 11s. per ton.

But the export coal values, after all, apply to only some 60 million tons at the most, including coke and the coal shipped for steamers in the foreign trade. If the two last-named items are deducted, the export values apply to less than 50 million tons, out of a total computed output of about 220 millions. There would therefore remain 170 million tons to be dealt with, as representing home consumption, or, rather, home consumption *plus* foreign shipping. This remainder is divisible into coking, manufacturing, household, gas, and steam fuel. In regard to all descriptions alike there has been a material rise of values, though not to the same extent. Coking coal has perhaps felt the impulse of heavy demands more than any other description, primarily because of the revival of our iron and kindred industries, but also because there has been unusual pressure on the part of foreign buyers, especially France and Germany. The usual price of coke at the ovens in Durham over a series of years has been about 9s. per ton. For a considerable part of last year, and up to the present time, the value of good coke at the ovens has been 22s. to 25s. per ton. So far as household coal is concerned, the average value in the London market for the four years ended 1897 was 15s. 2d. per ton, while the corresponding average since Midsummer of 1899 has been about 22s. per ton. At the greatest centre of the steam coal trade—at Cardiff—the average official price of that variety of fuel for the two years ended 1897 was 9s. 7½d. per ton f.o.b., whereas for some months past the best qualities of that fuel have been quoted at 20s. to 23s. per ton, and some sales have been recorded as high as 26s. Manufacturing coal, as the owners of iron, steel, shipbuilding, engineering, and other works know to their cost, has gone up fully 4s. to 6s. per ton, according to locality and description; while gas coal, of which the supply is far from unlimited, has followed a similar movement. On the whole, therefore, we are not likely to be far wrong in estimating that for the eight months ended the 1st of March this year there has been an advance of 5s. to 6s. per ton all round in the realized value of coal where supplies were free for sale, as, in view of the previous upward movement, they would generally be; so that coalowners should have had a difference of fully 5s. per ton to dispose of over and above the profits realized previously.

The "man in the street" is likely to find some difficulty in adequately realizing the fact that this difference of 5s. per ton would mean, on the estimated coal output of 1899, a total sum of 55 millions sterling, assuming that it had prevailed over the whole of that year. As, however, it only prevailed over a part, and as the material rise of prices did not take effect till after Midsummer, it is probable that the total increase of values for 1899 would not mean more than 4s. per ton, or 44 millions in all. A sufficient indication of the relative magnitude of this amount is furnished in the fact that even the smaller computation of increase is a larger sum by 5 millions than the total official value of our coal output so recently as 1887. For the last ten years, the recorded average value of our total coal output at the pit's mouth has fluctuated between 5s. 6d. and 7s. per ton. If the average for 1899 be taken at 10s. per ton, which is a highly conservative figure, the total value of the British coal output of 1899 will be about 110 millions sterling, or about 180 per cent. more than the recorded total value of 1887.

These vast figures suggest some notable and interesting problems. One of the more obvious is the equitable distribution of the great increase of profits—or, to put it more exactly, of selling price—realized in 1899, and to be realized in the current year. In the first place, it will not be overlooked that such a "boom" in the coal trade is almost a unique experience, and that no similarly prosperous period has been known since 1873-4, although no doubt in 1880 and again in 1889 coalowners enjoyed a comparatively good time. Speaking generally, the coal trade is subject, more than most other industries, to prolonged periods of apparently irremovable depression, and such a period lasted with hardly any amelioration from 1891 to 1898. During that time, coalowners for the most part were in the depths of despair. Another similar period of pronounced depression extended from 1884 to 1888. During this latter term, the average price of coal at the pit's mouth in Scotland was about 4s. per ton, against 10s. to 11s. per ton at the present time. It is manifest, then, that, if coalowners could not look forward to occasional periods of "spurt" and "boom," most of them would throw up the game, as many of them threatened to do not so long ago. A single year of good prices in the coal trade has more than once had to compensate for many weary and anxious years of bad prices and difficult profits.

Whatever, then, may be the share of the increased price that is falling to the coalowners, it must not be overlooked that it has to recoup them for many years of previous bad trade. But when the increased burdens laid on the coal trade, as the results of recent legislation and the higher cost of working all round, are taken into account, I do not believe that the increase of profits is so great as is commonly supposed. In this view, I am confirmed by the lately-published reports of coal companies.

So far as the miners are concerned, it would appear that they have had a reasonable, if not a sufficient, share of the increased value realized for coal over the last fifteen months. Most of them have had their wages advanced by successive increments until they now stand at 15 to 30 per cent. above the level of a year ago. The average increased wages of the miners has been put by Mr. Pickard, M.P., at about 8d. per ton; but it is well known that, in addition to general or district advances, there have been local or colliery advances, often extended to considerable localities, which would, if combined and averaged, bring up the total general increase of earnings to quite 1s. per ton. This, spread over the total coal output of the United Kingdom in 1899, would mean a gross increase on the year 1898 of about 11 millions sterling in the item of wages alone; or, if the average output per employee is taken at 300 tons a year, it would mean an individual increase for the year of £15.

It was inevitable that the prospect of large profits should tempt coalowners and capitalists to adopt energetic measures to bring about an increase of coal production. From the various projects of this character that have come to my knowledge—including not only the opening out of

new collieries, but the re-opening of old ones and the sinkings made to other seams in existing pits—I am of opinion that within the last fifteen months provision has been made for adding quite 20 million tons a year to the coal output of the United Kingdom; and if the same average annual output per employee as that of the period 1894-7 is assumed, the increased resources of production will probably be considerably more. The throwing of this large additional volume of coal on the market is likely to convert the present relative scarcity into an absolute glut. The question is—When? On this point one cannot profess to be any wiser than the "man in the street." No one knows what the coalminers may do; and they are virtually the masters of the situation. If they work steadily, and take only an average number of holidays, we may look for greater abundance as a proximate event. If they adopt organized restriction, as they did in 1873-4, and have several times done since, they may succeed in keeping up prices for a considerable time to come. In these matters the attitude of labour—which is generally the "dark horse"—counts for much. But, in any event, no relief worth speaking of is to be expected from foreign countries. We have already seen that their position is quite as strained and as parlous as our own.

It was recently suggested in Parliament that another Royal Commission should be appointed to inquire into the extent and duration of our coal supplies. Thirty years have now passed since the Argyll Commission reported on this subject. In the interval, nearly 5000 million tons of our then existing coal supplies have been used up. In many other respects the conditions have changed. Some of our most important fields are rapidly nearing a period of permanently dearer cost of working, which will seriously prejudice the general economic outlook of manufactures and commerce. Our keenest and most successful industrial rivals have greatly cheapened their coal supplies—notably Germany and the United States. There is an uneasy feeling on the whole subject throughout the country. Parliament appointed a Select Committee to inquire into the coal famine of 1873; and the indifference shown by the Government to the coal crisis of the present time is difficult to understand.

ELECTRIC LIGHTING NOTES.

An electric wire conduit running under the footpath of the Old Market Place, Oldham, became charged with gas through a leakage from the neighbouring gas-pipes. During the testing of an arc lamp by workmen of the Corporation Electric Lighting Department last Friday, the gas was ignited (presumably by a spark), and an explosion occurred. The whole of the footpath for a distance of about 50 yards was displaced, and huge pieces of stone and iron were thrown into the air higher than the tops of the surrounding buildings. Happily, nobody was hurt.

Some progress is being made in connection with the endeavours put forth during the past two or three years by the Bermondsey Vestry for the purpose of establishing an electric lighting station and refuse destructor. The assent of Parliament having been obtained to the electric lighting scheme last year, it became necessary to provide land for the erection of the buildings; and a site was recently acquired at the rear of the Town Hall in Spa Road. The area of land allocated to the purpose of the generating station and destructor comprises 2987 square yards, and there is room available for future extensions as occasion may arise. The electric lighting scheme, which has been prepared by Messrs. Kincaid, Waller, and Manville, provides for an expenditure of £17,000 on the destructor-house, engine-house, and chimney-shaft; £11,000 for a six-cell destructor and flues, and three water-tube boilers in conjunction therewith; £8000 for machinery, including 300-kilowatt generators, accumulators, &c.; £7000 for cables and house-service connections; £600 for twenty public arc lamps; and £4300 for contingencies. It is estimated that this plant will be capable of dealing with a lamp connection of 10,500 8-candle lamps. The Vestry recently accepted a tender for the supply of the destructor and boilers, for £10,242. The question of constructing the generating station and obtaining the requisite plant has yet to come before the Vestry. As Bermondsey will in November next absorb, under the London Government Act, 1899, the parishes of Rotherhithe, St. John, Horseleydown, and St. Olave's, under the title of the borough of Bermondsey, and thereby receive an accession of 52,000 persons to the population, it is probable that the new Borough Council will find it necessary to extend considerably the scope of the electric lighting scheme.

The St. Pancras Vestry's electric lighting accounts, showing, as mentioned in the "JOURNAL" last week, a net profit for 1899 of £8734, appear very satisfactory to the superficial reader; but a little investigation rather takes the gloss off them. The total amount now borrowed on the security of the rates is no less than £236,780, and the stated profit works out at about £3 13s. 9d. per cent. per annum. Taking the temporary loans, amounting to £17,876 14s. 6d., into consideration, the percentage is only £3. Of the total indebtedness of £236,780, repayments have been made to date of £17,246 14s. 7d.—£3374 6s. 4d. during the year under review. As advocated by the "JOURNAL" during the early stages of the Vestry's undertaking, a reserve fund has at last been formed, and consists of £8000—£4000 being transferred from the year's profit. Another £1000 has been written off for depreciation of accumulators, and £600 for depreciation of meters, switches, &c.—a wise course decided on at the last meeting of the Vestry, when a contribution of £2000 to the lighting rate was made; leaving an unexpended balance of £1134 9s. 6d. to be carried forward. It cannot be contended that the current is used anything like so extensively as the Vestry's preparations would warrant, for there are only 1184 consumers to purchase the products of mains which alone have cost altogether £125,744 to lay. Repairs, "re-arrangements" and "alterations" to the mains, &c., cost £4071 9s. 10d. last year; the generation of the current (coal, wages at stations, &c.), £16,566 16s. 5d.; and "compensation claims" (ominously headed "special charges"), £93 18s.—the whole expenditure being £27,230 11s. 8d. The total receipts from consumers were £37,692 9s. 9d.; from the public lighting fund, £6639 17s. 8d.; and a few other sundry receipts make the total income for the year £44,880 7s. Interest on the mortgage debt, however, reduced the gross profit by £6454 10s. 8d., and further interest and instalments off loans by another £4353 5s. 2d.; making the net profit for the year £6841 19s. 11d. Adding the sum brought from last year, the net balance is £8734 9s. 6d. The actual net profit of £6841 19s. 11d. for the year is less than 2½ per cent. on the capital expenditure.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

In the Glasgow Town Council, on Thursday, a paragraph in the minutes of the Gas Committee stated that on the 12th inst. the Engineer (Mr. W. Foulis) submitted the general plan and drawings of the first section of the new Provan gas-works, which includes offices, retort-house, coal-store, purifier, boiler and meter houses, two gasholders capable of containing 8½ million cubic feet of gas each, and the necessary excavation work. The Committee, having considered the plans and drawings, approved of the same, and authorized the necessary specifications to be prepared, and thereafter tenders for the execution of the several works to be advertised for. Mr. P. G. Stewart—a member of socialistic tendencies—took exception to this; pointing out that it was an illustration of how the Council would pass matters involving the expenditure of half-a-million of money, while they would take hours discussing the spending of two or three hundred pounds. He thought they should be told how much was to be spent upon the works, and that they should have more time to discuss the subject. He moved to that effect. Mr. R. M. Mitchell, the Convener of the Gas Committee, said he could not accept the suggestion. The plans had been agreed to at a full meeting of the Committee. Bailie Fife said he thought it was due to the Convener of the Gas Committee that it should be stated that the cost of the new gas-works had been entered in the minutes within the past twelve months; and also that for many years the Finance Committee had brought before the Council that at the Dalmarnock works, where they carbonized so much coal, the loss from imperfect machinery was from £9000 to £12,000 a year. There was, therefore, necessity laid upon them to proceed with these works. The plans might, however, be shown round the room. Mr. Paton thought that there could be no objection to the plans being exhibited; but meantime the work must be gone on with, because there was great prospective loss. The Committee did not ask power to accept tenders, but simply to advertise for them; and Mr. Stewart would have plenty of opportunity to criticize the offers in all their details, when they came up. Mr. Stewart then withdrew his motion; and the minutes were adopted. I am afraid that Mr. Stewart's conscience became tender at the wrong time. He must have been well aware of the very large expenditure intended to be made upon the Provan gas-works; and if he thought it desirable that criticism should be offered upon the proposed outlay, he should have spoken when power was being taken to prepare plans. I suppose that in the Glasgow Corporation, as in others, matters of small moment are often discussed at inordinate length; while subjects involving large responsibilities are passed through without much consideration. To this extent, Mr. Stewart may be sympathized with. But, in the present instance, what could have been gained by discussion? Nothing. It would be absurd to imagine, or to suggest, that any of the councillors could have improved upon Mr. Foulis's plans. Any time devoted to discussion, therefore, would have been thrown away. Mr. Mitchell told the Council that the works would be described when the ceremony of cutting the first sod was performed. If that be so, it should be enough. Life in Glasgow is too short for making two speeches where one is sufficient.

At the same meeting, a letter from the Secretary of the Gas-Workers' Union, complaining of the alleged unjust dismissal of several men from the gas-works, was read. On the suggestion of Lord Provost Chisholm, the communication was remitted to the Gas Committee. The letter, it may be presumed, is one of the methods of making the Council Chamber ring with the demands of the Gas Workers' Union for recognition, which, it was said, would take place until recognition has been granted. The sending of this letter to a Committee is, of course, a species of recognition. What right have the Union to complain on behalf of men who may be dismissed? Let the men themselves petition for reinstatement. It will be advisable, in framing their report to the Town Council, and the reply by the Town Clerk to the Union, to make it plain that the Corporation do not admit the right of the Union to call in question their employment or dismissal of workmen.

The Forfar Gas Corporation, at a meeting on Wednesday, had before them a letter from the Law Agent for Messrs. Macpherson and Irvine, of Kirriemuir, the Contractors for the construction of the tank for the new gasholder, in which it was stated that the Contractors did not wish to lead further proof in the reference, and were desirous of having the matter settled. The sum due to the Contractors under the strict interpretation of the contract adopted by the Referee was £746; but it fell short by £200 or £300 of what they had expended in its fulfilment. While the Referee disallowed the claim to that extent, he submitted that the Commissioners would only be dealing fairly by the Contractors in allowing them a reasonable sum for this extra expenditure. Through the shifting of the site, the Contractors had suffered heavily; but the Commissioners had benefited greatly in the more convenient arrangement of access, &c., and in having the larger portion of the north wall entirely renewed. His clients wished to place themselves in the Commissioners hands, and trusted their request might meet with favourable consideration. Provost M'Dougall said the Committee thought it would be well to have all the information before them as to the expense of the arbitration before coming to a decision; and this being assented to, consideration of the subject was postponed.

At Peebles a proposal has been made, as a sort of reply to a request by the men employed at the gas-works for an increase of wages, that they be paid at the rate of 3½d. per 1000 cubic feet of gas made. In this way, it not being known what the output might be, the men would be paid 27s. a week, and the balance—a sort of bonus—at the end of the year. The Manager (Mr. A. Bell, jun.) said that the wages would be 28s. 3d. per week to constant men, and 29s. per week to winter men. The scheme did not find favour all round; and consideration of it was delayed. The idea is to get the men to take as much gas out of the coal as possible. I am not enamoured of it, because it implies the existence of a belief that workmen do not do the best they can; and, further, I think experience in all ages has demonstrated that a suspected man does not do so well as one in whom confidence is placed.

The Stirling Gas Company have experienced the extraordinary increase in the output of gas during the past three years of almost 20 million cubic feet. Such an augmentation could have only one result—enlargement of the plant. The gas-works are new; and their extension is an easy matter; provision having been made for this when

required. But the storage capacity is different. There are three gasholders, of a total capacity of 320,000 cubic feet. The maximum daily output is over 420,000 cubic feet. The Company have, accordingly, let contracts for the erection of a new holder, at a cost of nearly £10,000. Two lifts are to be erected, giving an addition to the storage capacity of 300,000 cubic feet; and provision is to be made for the addition of a third lift, when necessary, which will give a further capacity of 120,000 cubic feet. The tank is to be above ground. Both the holder and the tank are to be constructed of mild steel. They are to rest upon a bed of concrete 3 feet in thickness. The tank is to be 102 feet in diameter, and 20 ft. 6 in. deep. The outer lift is to be 98 feet, and the inner one 96 feet, in diameter. The lifts are to be 20 feet in depth. The guide-framing will consist of twelve lattice standards, 62 feet in height, braced together by two rows of lattice girders and diagonal tie-rods. The Contractors for the holder and tank are Messrs. Hanna, Donald, and Wilson, of Paisley; and the Engineer is Mr. J. D. Smith, the Engineer and Manager to the Company. The erection of the new gasholder involves the removal of Mr. Smith's dwelling-house.

The Arbroath Gas Corporation have an admirably easy way of conducting their business. At a meeting this week, Mr. Aitken drew attention to the long periods that were sometimes allowed to elapse between the meetings of the Corporation. Between that meeting and the previous one, a period of five months had passed. The Clerk suggested that a meeting of the Committee of Management might be held every month. Ex-Bailie Sandeman said that the work of the Corporation was comparatively small; and he did not see that there was any reason for holding so many meetings as was suggested. After discussion, it was agreed to hold a meeting of the Committee of Management every two months. Mr. Aitken appears to be grieved at having so few opportunities of hearing himself speak. He wanted to know why the illuminating power of the gas had been reduced from 25 to 23 candles; and it was explained to him by ex-Provost Keith that on dull days the pressure was reduced and the illumination might not be so bright, but that everything was done to maintain the ordinary standard of illuminating power. This reply would be hard to beat for *naïveté* I commend it as a model for distressed consumers.

A Sub-Committee of the Dundee Town Council yesterday considered reports by the Gas Manager and the Electrical Engineer upon street lighting. These stated that the annual cost of lighting streets where there are tramway-lines would be £348 by gas and £1138 by electricity; while, in the latter case, there would be an initial outlay of £1730. The Committee resolved to restrict the electric lighting to 22 new lamps.

The Denny Police Commissioners have let a contract to the Barrowfield Iron-Works, Limited, of Glasgow, for the construction of a new gasholder of 60,000 cubic feet capacity, at a cost of £3500. The Convener (Mr. Shanks) said it was a thing which must be proceeded with at once, notwithstanding the advanced prices. He did not see how they could face another winter without more storage accommodation. At present their storage was equal to only about one-third of the maximum day's consumption. Mr. J. M'Gilchrist is the adviser of the Corporation.

The Dumfries Gas Commissioners have found, in contracting for coal, that the price is about 4s. per ton more than under current rates. The price of oil has advanced even more, proportionately. The Commissioners have purchased 1500 tons of Elmbank cannel; and the suggestion has been made that cannel should be used for enrichment, and that oil should be dispensed with. Bailie Currie feared they would be obliged to put something like 6d. per 1000 cubic feet upon the price of the gas.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *April* 21.

Sulphate of Ammonia.—Business has been somewhat interfered with by holidays; and prices are very irregular—the closing quotations being £11 7s. 6d. to £11 12s. 6d. per ton, delivered f.o.b. at the ports. A fair amount of buying has been done. But this has only been induced by concessions in prices; and buyers are looking for still lower levels. Supplies have not been excessive, though fairly abundant; but everything is being offered as it becomes available. There is almost no interest in the forward position. Makers seem hopeful for a recovery in values; while buyers take a different view.

Nitrate of Soda is weak on spot, at 8s. 6d. per cwt. for ordinary, and 8s. 7½d. for fine, quality.

LONDON, *April* 21.

Tar Products.—Warmer weather and difficulties with labour have seriously interfered with and delayed shipments of, pitch. The shipping season, however, is rapidly closing; and it is expected that the quantities will be disappointing as compared with the previous year. There is no change for the better in benzol, which is still extremely sick. Carbolic acid is firm; but solvent and other naphthas are weak and unsaleable. The falling off in this respect is most noticeable in burning naphtha. Creosote is a little steadier after a determined effort to depress it. There is no change in the value of the other numerous tar products.

Values obtaining during the week are: Tar, 17s. 6d. to 27s. 6d. Pitch, east coast, 37s. 6d.; west coast, 34s. Benzol, 90's, 5½d.; special qualities for gas, 7½d.; 50's, 8½d. Toluol, 90's, 1s. Solvent naphtha, 1s. Crude naphtha, 3½d. Heavy naphtha, 9d. Creosote, 2¾d. Heavy oils, 3½d. Carbolic acid, 50's, 2s. 2d.; 60's, 2s. 7d. Naphthalene, 50s. to 70s. Anthracene, "A," 4d.; "B," 3d.

Sulphate of Ammonia.—The position of sulphate is far from satisfactory. A most unaccountable fall in prices is going on in the face of manufacturers having no stocks and very important shipments; and there cannot be a doubt that operations for depressing this market are proceeding. It is hoped that makers will not lend themselves to them by being too eager to sell. The demand is undoubtedly good; and while it is true that buyers are clamouring for cheaper sulphate, they can well afford to pay the price that has recently obtained for some time. Very little business is reported; but dealers' quotations show an average at all ports of £11 10s., less 3½ per cent.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1047.

Issue.	Share	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 11	10½	Alliance & Dublin 10 p. c.	20—21*	..	5 0 0
100,000	10	,,	7½	Do. 7 p. c.	13½—14½*	..	5 3 5
800,000	100	Jan. 2	5	Australian 5 p. c. Deb.	100—102	..	4 18 0
200,000	5	Nov. 15	6	Bombay, Ltd.	6½—6¾	..	4 8 11
40,000	5	,,	6	Do. New, £4 paid	4½—4¾	..	5 1 1
880,000	Stk.	Feb. 23	12	Brentford Consolidated	250—260	−5	4 12 4
270,000	,,	,,	9	Do. New	195—200	−2	4 10 0
50,000	,,	,,	5	Do. 5 p. c. Pref.	140—145	..	3 9 0
159,375	,,	Dec. 14	4	Do. 4 p. c. Deb.	118—123	..	3 5 1
220,000	Stk.	Mar. 14	11½	Brighton & Hove Orig.	257—242	..	4 15 0
296,320	,,	,,	8½	Do. A. Ord. Stk.	190—185	..	4 11 11
299,500	Stk.	Feb. 23	5	Bristol, 5 p. c. max.	135—130	..	3 16 11
420,000	20	Mar. 29	10	British	41½—42½	..	4 13 0
50,000	10	Feb. 23	12	Bromley, Ord. 10 p. c.	24—26	..	4 12 4
19,000	10	,,	9	Do. 7 p. c.	19—21	..	4 5 8
500,000	10	Oct. 13	6	Buenos Ayres (New) Ltd.	9¾—10½	..	5 17 1
220,000	Stk.	Dec. 29	4	Do. 4 p. c. Deb.	99—101	..	3 19 5
150,000	20	Mar. 14	8½	Cagliari, Ltd.	25—27	..	6 2 3
100,000	10	Sept 29	8	Cape Town & Dis., Ltd.	14½—15½	−½	5 3 3
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	56—58	..	5 3 5
550,000	Stk.	Apl. 11	13½	Commercial Old Stock	295—300*	..	4 10 0
236,425	,,	,,	10½	Do. New do.	230—235*	..	4 9 4
238,237	,,	Dec. 14	4½	Do. 4½ p. c. Deb.	142—145	..	3 2 1
800,000	Stk.	Dec. 14	9	Continental Union, Ltd.	160—170	..	5 5 11
200,000	,,	,,	7	Do. 7 p. c. Pref.	175—180	..	3 17 9
51,600	Stk	Feb. 23	14	Croydon A 10 p. c.	335—340	..	4 2 4
173,400	,,	,,	11	Do. B 7 p. c.	265—270	..	4 1 5
555,000	Stk.	Feb. 23	5½	Crystal Palace Ord. 5 p. c.	130—135	−2	4 5 4
60,000	,,	,,	5	Do. 5 p. c. Pref.	130—135	..	3 14 1
486,090	10	Jan. 26	11	European, Ltd.	19¾—20½	..	5 7 4
354,060	10	,,	11	Do. £7 10s. paid	15—16	..	5 3 2
14,993,075	Stk.	Feb. 9	4⅛	Gas-light and Coke	4 p. c. Ord.	101—103	−1	4 15 1
2,500,000	,,	,,	3½		3½ p. c. max.	97—99	..	3 10 8
3,799,735	,,	,,	4		4 p. c. Con. Pref.	119—122	..	3 5 7
3,993,975	,,	Dec. 14	3		3 p. c. Con. Deb.	98—100	..	3 0 0
70,000	10	Nov. 15	8	Hongkong & China, Ltd.		13¾—14½	..	5 10 4
3,800,000	Stk.	Nov. 15	10	Imperial Continental		211—214	..	4 13 6
473,600	Stk.	Feb. 9	3½	Do. 3½ p. c. Deb. Red.		100—103	..	3 8 0
75,000	5	Dec. 14	6	Malta & Medn., Ltd.		4¾—5¼	..	5 9 1
660,000	100	Apl. 2	5	Met. of Melbourne	5 p. c. Deb.	105—109	..	4 11 9
250,000	100	,,	4½		4½ p. c. Deb.	105—107	..	4 4 1
641,920	20	Nov. 15	3	Monte Video, Ltd.		11—12	..	5 0 0
667,946	Stk.	Feb. 23	9½	Newc'tle & Gatesh'd Con.		215—220	..	4 4 1
299,855	Stk.	Dec. 29	3½	Do. 3½ p. c. Deb.		104—107	..	3 5 5
150,000	5	Nov. 30	8	Oriental, Ltd.		7—7¾	..	5 6 8
135,000	5	,,	8	Do. New, £4 10s. pd.		6¾—6¾	..	5 6 8
15,000	5	,,	8	Do. do. 1879, £1 pd.		1¼—1¾	..	4 11 5

* Ex div.

Issue.	Share	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
60,000	5	Feb. 23	7	Ottoman, Ltd.	5—5½	+¼	6 7 3
500,000	100	Dec. 1	6	People's Gas of Chicago 2nd Mtg. Bonds	102—106	..	5 13 2
851,070	10	Oct. 13	7	River Plate Ord.	11—11½	−¼	6 1 9
250,000	Stk.	Dec. 29	4	Do. 4 p. c. Deb.	100—102	..	3 18 5
250,000	10	Apl. 11	8	San Paulo, Ltd.	1⅛—12¼*	..	6 8 0
135,000	Stk.	Sept. 15	10	Sheffield A.	249—251	..	3 19 8
209,053	,,	,,	10	Do. B.	249—251	..	3 19 8
447,427	,,	,,	10	Do. C.	249—251	..	3 19 8
5,600,000	Stk.	Feb. 23	5⅓	South Metrop., 4 p.c. Ord.	130—134	−3	3 19 7
1,520,000	,,	Jan. 12	3	Do. 3 p. c. Deb.	99—101	−1	2 19 5
380,940	Stk.	Nov. 30	5	Southampton Ord.	117—122	..	4 2 0
70,825	,,	Dec. 29	4	Do. 4 p.c. Deb.	120—125	..	3 4 0
120,000	Stk.	Mar. 14	6	Tottenham and Edmonton A. 5 p.c. B. 3½ p.c. 4 p. c. Deb.	139—141	..	4 5 1
250,520	,,	,,	4½		100—102	..	4 8 3
55,100	,,	Dec. 14	4		113—117	..	3 8 5
182,380	10	Jan. 12	5	Tuscan, Ltd.	8—9	..	5 11 1
149,900	10	Jan. 2	5	Do. 5 p. c. Deb. Red.	101—104	..	4 15 2
				WATER COMPANIES.			
780,399	Stk.	Dec. 29	11	Chelsea, Ord.	305—310	−2	3 11 0
150,000	,,	,,	5	Do. 5 p. c. Pref.	157—162	..	3 1 9
160,000	,,	,,	4½	Do. 4½ p. c. Pref. '75	145—150	..	3 0 0
175,785	,,	Mar. 29	4½	Do. 4½ p. c. Deb.	145—150	..	3 0 0
1,720,560	Stk.	Apl. 11	7	East London, Ord.	195—200*	−1	3 10 0
654,740	,,	Dec. 29	4½	Do. 4½ p. c. Deb.	145—150	..	3 0 0
390,000	,,	,,	3	Do. 3 p. c. Deb.	99—101	..	2 19 5
700,000	50	Dec. 14	7½	Grand Junction 10 p.c. max. 4 p.c. Deb.	106—108	−1	3 9 5
310,000	Stk.	Mar. 29	4		130—135	..	2 19 3
708,000	Stk.	Feb. 23	14	Kent	307—312	..	4 9 9
160,000	,,	,,	7	Do. New, 7 p. c. max.	200—210	..	3 6 8
1,043,800	100	Dec. 29	10½	Lambeth, 10 p. c. max.	294—299	−1	3 10 3
406,200	100	,,	8	Do. 7½ p. c. max.	212—217	−3	3 13 9
850,000	Stk.	Mar. 29	4	Do. 4 p. c. Deb.	130—133	..	3 0 2
500,000	100	Feb. 23	13½	New River, New Shares	418—423	..	3 3 9
1,000,000	Stk.	Jan. 26	4	Do. 4 p. c. Deb.	132—137	..	2 18 5
902,300	Stk.	Dec. 14	7½	South-wark and Ord. 7½ p.c. max. 5 p.c. Pref.	200—205	..	3 13 2
126,500	100	,,	7½		190—195	..	3 16 11
489,200	Stk.	,,	5		160—165	..	3 0 7
1,019,585	,,	Apl. 11	4	Vauxhall 4 p.c. A Deb.	129—134*	..	2 19 9
1,155,066	Stk.	Dec. 14	10	West Middlesex	287—292	−1	3 8 6
200,000	,,	,,	4½	Do. 4½ p. c. Deb.	147—152	..	2 19 3
200,000	,,	Mar. 14	3	Do. 3 p. c. Deb.	99—101	..	2 19 5

*Ex div.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—There is no further development as yet to notice in connection with the gas coal trade in this district, beyond what was reported some weeks back. The large users, however, are making preparations for sending out their usual tenders, which, when they come upon the market, will test the strength of the position taken up by coal-owners with regard to next season's prices. As already intimated, a definite understanding has been come to, both by the Lancashire and the Yorkshire gas-coal collieries, acting in combination, to hold out for an advance of 5s. per ton over last year's prices. Some of the largest users of gas coal seem scarcely, however, to have made up their minds as yet that they will have to pay this advance to the full extent; but the certainty that the contracts can only be placed at prices very much above those of last year is already having its effect in the consideration of an advance in the price of gas to cover the probable increased cost. With regard to the general trade, the position continues strong all round. The holiday stoppages of the pits for three or four days last week have necessarily curtailed the supplies offering in the market; and this for the time being gives further strength to prices, which for all classes of fuel are exceedingly firm at the maximum quotations. The requirements in connection with fuel for iron-making, steam, and general manufacturing purposes are as brisk as ever; and there is a continued shortness of supplies of steam and forge coals and engine fuel. A noticeable feature is that the West Lancashire collieries have not followed the further advance of 5d. to 10d. per ton announced in the Manchester district, as they regard this as simply a levelling up of prices to the rates that were previously ruling in West Lancashire. At the pit, prices remain at 14s. 6d. to 15s. 6d. per ton for best Wigan Arley, 13s. to 14s. for Pemberton four-feet and seconds Arley, 12s. to 13s. for common round coal, and from 10s. for the lower qualities to 11s. and 11s. 6d. for the best sorts of slack. Shipping has fallen off a good deal of late; buyers evidently holding back from paying the basis price decided upon by Lancashire collieries. This, however, remains at 16s. per ton for steam coal, delivered at the ports on the Mersey. But not much business is being put through; and there are rumours of a breaking away in some quarters. Coke continues in pressing demand; and it is difficult to place new orders except at some advance on the current list basis, which remains at about 24s. to 25s. for ordinary furnace qualities, and 29s. up to 32s. for foundry cokes, at the ovens.

Northern Coal Trade.—There is now full work at the Northern collieries; and as the demands have increased during the last few days, the shipments of coal are at the present time very heavy. Best Northumbrian steam coals are firm at about 18s. per ton f.o.b.; and steam smalls are very scarce at 11s. 6d. to 12s. In manufacturing coals, the price is steady; and the demand is again full. Gas coals are in brisk demand, both on old contracts and for occasional cargoes. It is known that part of the contracts for the Metropolitan Gas Companies have been placed in Yorkshire, and are to be shipped from thence to the Thames. But other orders are being slowly settled; and the prices for six or twelve months' contracts vary from 15s. 6d. to about 16s. 6d. per ton f.o.b. For occasional cargoes of gas coals, the price is from that last named to 17s. per ton. There is no alteration in the price of smithy coal. In the coke trade, the demand is full, and prices are very firm—about 35s. per ton being quoted for export. There is this week no alteration in the quoted prices for gas coke.

Scotch Coal Trade.—As was expected, with the opening of the Baltic to navigation, the demand for coal is getting stronger. Prices are advancing, and are expected to go higher yet; there being a great demand for shipping. The rates quoted are: Main 14s. to 14s. 3d. per ton f.o.b. Glasgow, ell 14s. 9d. to 16s., and splint 14s. 9d. to 15s. The shipments for the week amounted to 211,089 tons—an increase of 16,633 tons upon the previous week, and of 52,561 tons upon the corresponding week of last year. For the year to date, the shipments have been 2,097,009 tons—being an increase to the extent of 684,163 tons upon the same period of the previous year.

The Newcastle correspondent of "The Times," writing last Saturday, said: "The South Metropolitan Gas Company are reported to have bought a proportion of their ensuing year's requirements of gas coal at about 16s. f.o.b. Tyne."

The Middlesbrough correspondent of "The Iron and Coal Trades Review" reports that "some very satisfactory contracts have lately been booked for gas coals for forward delivery; and there are cases where consumers want to buy for delivery over the whole of next year. The general quotation for best Durham gas coals is 17s. per ton f.o.b.; and this has been paid for considerable quantities. The Commercial Gas Company, of London, is said to have bought best Durham gas coal for delivery over the summer months at 16s. per ton f.o.b."

Consolidated Water-Works Company of Rosario, Limited.—The gross revenue of the Company for the year ending Dec. 31, after making due provision for bad and doubtful debts, amounted to £37,019, and the working expenses to £16,087; leaving a balance of £20,932, which has been carried to the net revenue account. After providing for debenture stock and other interest and income-tax, writing £250 off preliminary expenses, and placing the sum of £1000 to depreciation fund, there remains an available balance of £11,648 at the credit of net revenue account. On the 1st of November last, an interim dividend of 3 per cent. was paid on the preference shares; and the Directors recommend a further dividend on these shares of 3 per cent. (making the full dividend of 6 per cent. for the year), carrying the balance of £3302 to the credit of the ordinary share dividend account. This amount, added to £1058 already at the credit of the ordinary share dividend account, makes a total of £4360, out of which the Directors recommend the payment of a dividend of 2½ per cent. on the ordinary shares, absorbing £2625, and leaving £1735 to be carried forward. The depression which has prevailed so long in Rosario was less severe last year, and the improvement helped the Company in the collection of their revenue.

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The Legality of Water Divining.—A meeting of ratepayers was held at Ipplepen (South Devon) recently, to consider the question of the special rate levied by the Rural District Council to meet the cost of the abortive scheme for providing a water supply for the village. It was resolved to resist payment of the rate until the opinion of the Local Government Board had been obtained upon the legality of the action of the Council in spending £500 in "divining" and searching for water. A Committee was appointed to take measures for the defence of any ratepayer who may in the meantime be summoned for non-payment of the rate; and a defence fund was opened.

Rural and Parish Councils and Gas Undertakings.—Parish Councils, says the "Local Government Journal," are not empowered either to establish gas-works or to purchase those now existing. This is the answer of the Local Government Board to several proposals which have recently been submitted to them by Parish Councils. It follows therefrom that a Parish Council exercising the powers of the Watching and Light Act of 1833 and the Local Government Act, 1894, can only contract with a company or person for the supply of gas or other illuminant. They can provide the lamps and apparatus at the cost of the poor-rate, but they cannot obtain control over the manufacturing plant; and if no gas or electricity is available, they must content themselves with oil. Rural District Councils are under a similar disability.

Buenos Ayres (New) Gas Company, Limited.—The report which the Directors of this Company will present at the annual general meeting on the 30th inst. shows that the profit for the past year amounted to £48,694. After payment of the fixed charges, and making provision for bad and doubtful debts, there remains to be dealt with the sum of £33,224. From this amount, £12,500 has already been paid to the shareholders as an interim dividend; and the Directors recommend a final dividend of 7s. per share, free of income-tax; making 6 per cent. for the year, and leaving £3224 to be carried forward. Additions have been made to the reserve fund, which now stands at £40,000. Apart from the considerable amounts which have been expended on the maintenance of works, £10,406 has been written off the past year's revenue for depreciation, new plant, &c.

Ilfracombe Water Supply.—The scheme proposed by the Ilfracombe District Council for increasing the water supply of the town was again under the consideration of the Fishery Conservators of the Rivers Taw and Torridge at their last meeting. It was reported that the Committee proposed to take one-third of the water flowing into the Bray at Challacombe; and the opinion was expressed that in a dry summer like the last hardly any water would remain if so considerable a quantity were abstracted. The Rev. J. V. Tanner said he was convinced that the fish would suffer unless compensation water were provided. It was proposed that no opposition be offered to the Bill; an opinion being expressed that a plentiful supply of water for a place like Ilfracombe was of much greater importance than a few trout. Mr. Tanner proposed an amendment to the effect that depriving the river of one-third of its water would be injurious to the preservation of fish, unless compensation water were provided. This was carried by a majority of one.

The Profits of the Bradford Gas-Works.—The Gas Committee of the Bradford Corporation have decided, and their decision has been approved by the Corporation, that there shall be no further appropriation of the profits of the gas undertaking except for purposes connected therewith. The unappropriated profits amounted on March 31, 1899, to £50,247.

Proposed Extension of the Mansfield Gas Works and Plant.—Application is to be made to the Local Government Board by the Mansfield Corporation for power to borrow £6600 for the extension of the gas-works and for additional plant. The amount will be apportioned as follows: Purifiers and house (part cost), £2000; extensions and enlargements of mains, £3600; and new meters, £1000.

The Transfer of the Fylde Water-Works to the Water Board.—There has just been issued by the Fylde Water Board an interesting report on the acquisition by them of the Fylde Water Company's undertaking, which passed into their hands last September. Notice to treat was given on Oct. 25, 1897, the Company claiming £1,422,891; but amicable arrangements were come to whereby the Board had to pay the Company £802,455 12s. 6d., of which £37,000, with interest from August, was to be paid in cash, and £765,455 12s. 6d. allotted in stock at 2¾ per cent. The total liabilities of the Board came to £890,311 6s. 4d., and upon this stamp duty amounting to £4451 15s. was paid. At the end of February last, the consumers numbered 20,045—an increase of 2534 on the year. The capacity of the reservoirs is 252 million gallons; the area of supply 120,000 acres; the normal population, 120,000; the maximum daily consumption, 4 million gallons; and the minimum consumption, 2½ million gallons. The Board is constituted of seven members from Blackpool, three from Fleetwood, three from Lytham, and two from St. Anne's-on-the-Sea.

Obtaining Power from Water-Mains.—The "Dundee Advertiser" for last Wednesday contained the following particulars of a scheme for obtaining power from water-mains: "Now and again we hear of projects for deriving power from the tides; but as yet no practical scheme of this kind has been devised. We learn, however, that a local gentleman has just taken out protection for an invention on other lines which promises great probabilities. This is a motor for utilizing without waste the flow and pressure of water in city mains and pipes. No attempt, so far as we know, has hitherto been made in this direction. The invention referred to consists of a turbine motor, so arranged as to form part of the main. The whole body of water in the main passes through the turbine, so that all the pressure and fall of the water is converted into power, and the water continues on its course in the main without any waste. The motor is so constructed with folding vanes that there is no back-pressure or brake upon its action. Scores of such motors can be placed upon the route of one main, with only a slight decline of power in each succeeding one, while with equal advantage they may be used in the small pipes of towns. The possibilities of this invention as a source of revenue to corporations—who mostly own the gravitation supplies of our towns—is very great; the production of power costing nothing beyond the initial cost of the motor."

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SWINDON (New Swindon Gas Co.)	120,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR ST., BIRMINGHAM (Second Cont.)	2,000,000
HALIFAX	1,000,000
TORONTO	250,000
OTTAWA	250,000
LINDSAY (Remodelled)	125,000
MONTREAL	500,000
TORONTO (Second Contract; Remodelled)	2,000,000
BELLEVILLE	250,000
OTTAWA (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000
ST. CATHERINES (Remodelled)	250,000
KINGSTON, PA.	125,000
PETERBOROUGH, ONT.	250,000
WILKESBARRE, PA.	750,000
ST. CATHERINES (Second Contract)	250,000

	Cubic Feet Daily
BUFFALO, N.Y.	2,000,000
WINNIPEG, MAN.	500,000
COLCHESTER (Second Contract)	300,000
YORK	750,000
ROCHESTER	500,000
KINGSTON, ONT.,	300,000
CRYSTAL PALACE DISTRICT	2,000,000
DULUTH, MINN.	300,000
CATERHAM	150,000
LEICESTER	2,000,000
ENSCHEDE (HOLLAND)	150,000
BUENOS AYRES (RIVER PLATE CO.)	700,000
BURNLEY	1,500,000
KINGSTON-ON-THAMES	1,750,000
ACCRINGTON	500,000
TONBRIDGE	300,000
STRETFORD	500,000
OLDBURY	300,000
TODMORDEN	500,000
SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
YORK (Second Contract)	750,000

Netherlands Incandescent Gaslight Company, Limited.—The report of this Company for the past year states that, after making provision for bad and doubtful debts and allowance for depreciation, the net profit is £7157. Including the balance brought from the previous account and a sum written off as a bad debt, but subsequently recovered, the amount at the credit of the profit and loss account is £7280. The Directors recommend a dividend of 7½ per cent., and propose to write £850 off the fluid supply contract account and £138 off the premises account. These sums, together with the Manager's percentage and a bonus to the staff, leave a balance of £1926 to be be carried forward.

Dunstable Gas and Water Company.—At the 28th annual meeting of this Company on the 10th inst., the Chairman (Mr. B. Bennett) stated that the consumption of gas increased last year—being the first rise for some time. For several years the output was stationary or declining; but in 1899 they sold 12 million cubic feet of gas. The revenue account stood at £2716—an increase of £327; and from the balance of £1331, dividends of 7 per cent. on the "A" shares and 3½ per cent. on the "B" shares were recommended. The water undertaking showed an available balance of £1641, from which a dividend of 7½ per cent. was proposed. At present, the town had only one set of pumping plant; and it had been decided to sink a new borehole to a depth of 250 feet, which would supply 10,000 gallons of water per hour. With duplicate sets of pumps, they would have two strings to their bow. The dividends recommended were declared.

Trouble Over a Lighting Rate.—The "Sydney Daily Telegraph" directs attention to the extraordinary position in which the Municipality of Lambton stands with regard to the order of the Supreme Court (brought before the Full Court on Feb. 28). It appears that three Aldermen of the borough were imprisoned on the previous Saturday for contempt in connection with the order, and Counsel made an application for their release. It was urged that they had been appointed specially by the Government to carry out the order of the Court regarding the levying of a lighting rate, as the Municipality had refused to elect Aldermen; but the Chief Justice pointed out that the three Government nominees in their turn refused to do that for which they were appointed. It was contended that they had misapprehended the order of the Court; and it was stated that, in consequence of their having become Government nominees, they were looked upon with great disfavour by the ratepayers of the borough, and were not in sympathy with the law-breaking element. The Chief Justice observed that the case had a serious public aspect, because if the borough could escape their just liabilities, it would be very hard to say that other municipalities might not follow the same course of repudiation. The borough owed something like £12,000 to a bank for money spent in local improvements, of which they had all the benefit; but they now refused to pay a shilling off the debt. It was suggested to the Court that there should be some means of terminating such a scandalous state of affairs; but the Chief Justice remarked that he was afraid that there were no means available under the Municipalities Act. The borough had refused to strike a lighting rate to enable something to be paid off the debt to the bank.

Proposed Extension of the St. Mary Church Gas-Works.—At the last meeting of the St. Mary Church District Council, the Gas Manager (Mr. T. Evans) presented a report in which he recommended, among other things, the enlargement of the retort-house so as to permit of the erection of two additional benches of retorts. He thought the condensers should be replaced by more capacious ones, and a larger exhauster should be put down. These extensions should be commenced at once, so as to be completed during the summer. The Gas Committee thanked Mr. Evans for his report, and recommended that a Gas Engineer should be invited to inspect the works and advise as to the extensions necessary. The Council adopted this recommendation.

A Belgian Gas Undertaking.—At the recent meeting of the Belgian Gas Company, who carry on their operations under the title of the Société Anonyme d'Eclairage du Centre, the profit and loss account showed a balance of 3,547,312 frs. (£141,892), and the profit realized allowed of the payment of a dividend of 20 per cent.—viz., 10 frs. on the preference shares, and a like sum on the ordinary shares. The Company have a large interest in the gas undertakings at Lisbon and Rio. The consumption of gas is constantly increasing at the former place—having risen from 529 million cubic feet in 1891-2 to 776¼ millions in 1898-9; while at Rio everything is most satisfactory. The Company hold shares in other undertakings whose annual sale exceeds 1765 million cubic feet. Thus the gas-works of San Giovanni at Teduccio and Barletta, which also serve Torre del Greco, Barra Portici, Resina, &c., actually figure in the accounts for 3,411,339 frs. (£136,453). The contracts for the supply of these towns will not expire for another forty years. The Company have successfully negotiated a prolongation of concessions for the towns of La Louvière, Menin, &c.

Swansea Gas Company.—The ordinary general meeting of this Company was recently held under the presidency of Mr. T. T. Wood. In moving the adoption of the report, he reviewed the progress of the Company during the past half year, and showed an increase of 13½ per cent. in the quantity of gas supplied as compared with the six months ending December, 1898. This was attributable mainly to the prepayment meter supplies; but another increasing source of income was the cooking-stoves. This latter fact demonstrated the popularity of cooking by gas—a system which had been found exceedingly valuable during the recent "famine" prices of coal suitable for domestic purposes. The Company had during the past half year laid out in new works and the supply of prepayment meter fittings about £15,400; and it was quite probable that they would have to go on spending a very large sum annually in providing these meters. Roughly, he estimated that this would have to be done at the rate of 12,000 consumers per annum. Fortunately for the Company, they had been able to work on old coal contracts. The Directors, however, expected that in the new ones they would have to pay very much higher prices. In conclusion, he predicted that in the near future there would have to be a large outlay for new retorts and stoking machinery, This would result in economy in manufacture, and would lessen trouble with workmen and wages. Resolutions were passed declaring the authorized dividends.

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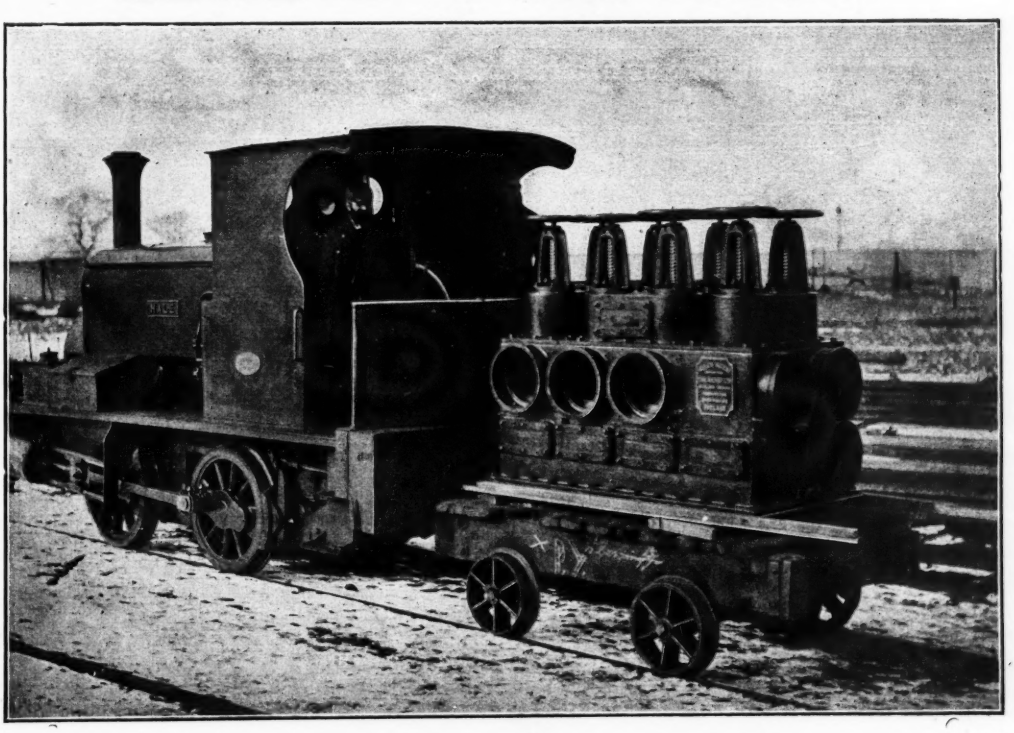

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Artesian Wells in New South Wales.—Sell's "Commercial Intelligence" gives currency to the news from Melbourne that, recognizing the importance of artesian water supply in the dry districts of New South Wales, a deputation of members of Parliament have urged on the Minister of Lands the necessity of introducing a vigorous policy in connection with boring operations. The Minister is said to be favourable to the scheme, and will ask the Premier to place £25,000 on the estimates to enable the necessary operations to be carried out.

Holmfirth Water Supply.—The Holmfirth District Council having applied to the Local Government Board for power to borrow £2250 for works of water supply, Mr. H. Percy Boulnois recently held an inquiry in regard thereto. The Clerk (Mr. Lomax) said the estimated population of the district was 9800, the assessable value £24,135, and the outstanding loans £8729. The chief items of expenditure were contemplated in connection with the reservoirs, the present capacities of which were: Snape, 3¼ million gallons; Austonley, 300,000 gallons; and Goose Green, 8000 gallons (constructed 1866). There was connection between the three supplies. It was proposed to increase the capacity of the Snape reservoir to 4⅓ millions, by raising the embankment 2 feet, and to extend the supply to several townships from which there have been repeated demands for water. The Surveyor and Water Manager of the Council (Mr. G. E. Vint) explained the details of the scheme.

The Growth of the Southend Gas-Works.—In the course of an interview with a representative of the Press, Mr. Frank Clark, the Engineer and Manager of the Southend Gas Company, recorded the change which has taken place in the works and business since he has been in the Company's service - viz., since 1878, when he became assistant to Mr. Septimus Penny, whose predecessors were the late Mr. W. H. H. Broadberry and his son, Mr. W. F. Broadberry, of New Southgate. In 1884, Mr. Penny retired, and Mr. Clark secured the vacant position, with Mr. Alfred Penny as Consulting Engineer. A few years later Mr. Penny died; and Mr. Clark was invested with the full control of the undertaking. Under his supervision, the works have been three times rearranged and extended. When he took command, the working staff consisted of 14 men and boys, with a pay-sheet of £20; now it numbers 110, with a wages-bill of £160. The retorts were heated by direct firing with hand labour, and the bulk of material used was between 7 and 10 tons per day; now the regenerative system is in use, with hydraulic stoking machinery, and the average daily consumption of coal is from 50 to 60 tons. Water-gas plant capable of producing 750,000 cubic feet per diem has been put up by Messrs. S. Cutler and Sons. The storage capacity was formerly only 40,000 cubic feet; but when the holder now building is completed it will be 1,500,000 cubic feet. The area of the works has been increased; and there is now room enough for plant equal to an output of not less than 3 million cubic feet of gas daily. The whole of the distributing system has been overhauled and extended, with a consequent reduction of leakage; and the public lighting has been greatly improved. These changes show that, as this popular seaside resort has grown, the Directors of the Gas Company have made ample provision for meeting its requirements as far as their commodity is concerned.

Road-Rollers and Damage to Water-Mains.—At a recent meeting of the Portishead District Council, a letter was read from Messrs. Curtis, Jenkins, and Co., on behalf of the Portishead Water Company, complaining of serious damage done to their property by the road-roller of the Council causing leakage, and asking that compensation should be made, and that the roller should not again be used at present. The Surveyor (Mr. F. H. Smith) stated where damage had been done to the pipes, but said he was sure it was not through any fault of the Council. The Chairman (Mr. E. G. Lorymer) suggested that they should write to the Company to the effect that the Council were not aware of any damage done; but if there was leakage, it was caused by the insufficient depth at which the pipes had been laid. This course was adopted.

The Use of Water for Gardens in Birmingham.—The Water Committee of the Birmingham Corporation are taking timely precautions to husband their stores of water, in view of a possible shortage in the summer. They have sent out notices to consumers, intimating that, in view of the insufficiency of the present works to meet the demand for water, and the consequent necessity for economy during the summer, they propose to enforce the powers under which any person using water for gardens and lawns without having previously agreed with the Corporation for a supply for such purpose, is liable to a penalty not exceeding £5. The Committee have not hitherto enforced these "powers;" but under present circumstances, they feel it to be their duty to do so, as regards the use of water for garden purposes by means of hose-pipes, automatic sprinklers, and other mechanical contrivances. Such a use will, in future, be dealt with as a contravention of the law, and if it is persisted in after this notice, it will render the offender liable to prosecution. The Committee do not propose to take any proceedings in respect of garden watering by hand.

Shrewsbury Water Supply.—A special meeting of the Shrewsbury Town Council has recently been held to consider the question of the water supply of the town. A letter was read from the Local Government Board urging the Council to lose no time in providing for the town an improved supply of drinking water. The Water Committee laid before the Council a draft letter which they proposed should be sent to the Board in reply. It pointed out that the Council had been considering the question of water supply for twenty years, that they had had many schemes before them, and spent many thousands of pounds in investigating them. The last scheme was to get a supply from high land at Batchcott; but the cost of carrying it out—£155,000—was at present prohibitory. The Committee, therefore, recommended that the present supply of drinking water should be extended by increasing the number of springs from which it is being obtained, and raising the water to a reservoir high enough to serve all parts of the town. The supply from the river would also be improved by the construction of new works, including machinery, subsidence tanks, filter-beds, and a new service reservoir. It was proposed that the letter should be adopted and sent to the Board. A long discussion followed, in which the suggestion to filter the river water for the purposes for which it would be used was strongly condemned; but eventually the proposition was carried.

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Accidents at Water-Works.—A well which is being sunk at the North Walsham Water-Works collapsed last Friday; and two men who were at work at a depth of 80 feet were buried alive. Efforts were made to rescue them, but with what success has not yet been reported. During some excavations at the Old Park Water-Works, Belfast, the same day, a heavy fall of earth took place. Three men were buried, but were speedily extricated. One, an aged man, is in a critical condition, another has a broken thigh, and the third is suffering from injuries to the lower part of the body.

Cowlyd Joint Water Board.—The finances of this Authority appear to be in a very unsatisfactory state; and the Local Government Board have called upon them to reorganize their position in this respect. The District Auditor in his audit has disallowed two sums—£629 and £709; and he has drawn attention to the fact that, owing to the failure of the Joint Board to provide sufficient funds for their requirements, the overdraft upon the current accounts amounted at the close of last year to £4803; while the overdraft on capital account was no less than £27,704. Application was made to the Central Authority to remit the disallowances; but they regard the statements of the District Auditor as so unsatisfactory that they have replied that it does not appear to them they can properly do so. The Board further observed that the Joint Board had paid for the main from Sarn Mynach to Llysfaen although by an award in August, 1897, only the cost of a portion of this main had to be borne by them. When the matter came before the Joint Board last Friday, no observations were made on the communication.

Teignmouth Gas Supply.—Further reference to the scheme for remodelling and extending the Teignmouth Gas-Works was made at a meeting of the District Council last Tuesday. Mr. T. Hutchings, a former member of the Council who has just been re-elected after an interval of two years, said that Mr. Stormonth, the Gas Manager, had condemned the plans of his predecessor after having seen only one of them, and in spite of the fact that these plans were approved by the late Mr. F. Livesey, whom the Gas Committee consulted as to the condition of the works. Mr. Hutchings also complained that since Mr. Stormonth had had charge of the works he had on one occasion sent into the town gas charged with sulphuretted hydrogen, and on another occasion an explosive mixture of gas and atmospheric air had been distributed. The Chairman (Colonel Morrison) said these matters had been satisfactorily explained to the Council; and Mr. Jarvis suggested that Mr. Hutchings might find more useful work than that of amateur critic of the gas management. Mr. Banbury said the Manager was endeavouring to economize labour at the gas-works after the mismanagement of past years. Mr. Smith thought the Manager ought not to be condemned before he had had a fair trial, and had been given an opportunity of putting the works into the condition in which he thought they should be. Mr. Stormonth said he found from the books that the make of gas was formerly 104,000 cubic feet per 24 hours with 40 retorts. During the winter, he was in terror lest the furnaces should fall to pieces, and one did so; but despite this, and with six retorts short, he made 108,000 cubic feet of gas in 24 hours. It was, however, impossible for the works to pay in their present state.

Beverley Water Company.—The report presented at the recent annual meeting of this Company showed that the income for the year ending the 31st ult. was £1665, as compared with £1635 before. The expenses were £859, being £61 more than in the previous year. After meeting these, and the cost of laying new services, the profit on the year was £801. After paying debenture interest and other preferential charges, and writing off irrecoverable arrears, there was a surplus of £460. The Directors recommended that a dividend of 4s. 6d. per share be paid; and that the balance be carried to the extensions account, 1898. The report was adopted.

The Directors of the Oriental Gas Company, Limited, have resolved to pay an interim dividend at the rate of 3½ per cent., free of income-tax, on account of the year ending June 30 next.

According to a Reuter's telegram which has lately appeared in certain papers, the Pittsburg Coal Company have received inquiries from German firms as to the price of Pittsburg gas coal.

At the recent anniversary of the formation of the Gas Workers' Union it was stated that there were 6000 members more than at this time last year, and that there had been an increase of 2000 in the past quarter.

The tender of the Leeds Fire-Clay Company (Engineering Department) has been accepted for completing, under the supervision of Mr. S. Glover, the fitting up of the extended retort house at the St. Helens Gas-Works.

There was naturally great rejoicing at Port Elizabeth when the news of the surrender of Bloemfontein reached that town on the 14th ult. The Manager of the gas-works (Mr. W. Arnot) was not a whit behind his fellow-townsmen in his public expression of gratification at this successful *coup*. He made a big bonfire at his works, and gaily decorated the large gasholder in celebration of the event.

After careful investigation into the various systems of stoking machinery, the Gas Commissioners of the Greenock Corporation have decided to adopt West's, and have placed a contract with West's Gas Improvement Company, Limited, to put up at their Inchgreen works the latest type of compressed air stoking machinery, including charging and drawing machines, air-compressing plant, &c.

The "Cannon" Hollow-Ware Company, Limited, of Deepfields, Bilston, are making considerable additions to their premises. On the 19th inst., the first section of the extensive new works intended to be completed in connection with the Company's gas-stove department was opened in the presence of the Directors of the Company. The new erections comprise a spacious foundry and necessary dressing-shops and stores.

The Gas Committee of the Birmingham City Council have announced that from the 16th inst. there will be an advance equal to 2s. 6d. a ton all round in the price of coke and breeze. In addition, they are revising the conditions on which the delivery of coke can be undertaken by the department. It is explained that these changes are due to the recent difficulties experienced in obtaining the haulage required for the prompt delivery of coke, the considerably increased cost of the available haulage, and the continued great demand for this kind of fuel.

LATEST DEVELOPMENT
IN
GAS-COOKERS

WRIGHT'S PATENT,
BY WHICH ALL THE
ADVANTAGES OF LOOSE BURNERS
ARE OBTAINED
WITHOUT
ANY OF THE DISADVANTAGES.

NO EXTRA CHARGE IS MADE
FOR THESE IMPROVEMENTS.

JOHN WRIGHT & CO.
LIMITED,
LONDON & BIRMINGHAM.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

JOHN WM. O'NEILL, Managing Director,
160, 161, & 162, PALMERSTON BUILDINGS,
OLD BROAD STREET,
LONDON, E.C.

ANDREW STEPHENSON, AGENT. All communications re Oxide to the Company as above.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for use in GAS-WORKS.
ANDREW STEPHENSON,
182, Palmerston Buildings,
Old Broad Street,
"Volcanism, London." London, E.C.

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

AMMONIACAL LIQUOR wanted.
BROTHERTON AND Co., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BENZOL, specially made for the Enrichment of Gas.
ELLISON AND MITCHELL, LIMITED, Kilnhurst, near ROTHERHAM.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

SPECIAL PAINT FOR GAS-WORKS.
JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1769.

GAS TAR wanted.
BROTHERTON AND Co., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PATENTS FOR INVENTIONS.
Messrs. J. C. CHAPMAN & CO., Chartered Patent Agents, ADVISE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

ENRICH your Gas with cheap Benzol.
Specially prepared, free from sulphur. At to-day's Price of Benzol, ILLUMINATING POWER costs less than ONE-THIRD OF A PENNY PER CANDLE.
Apply to SADLER AND Co., MIDDLESBROUGH.

PRACTICAL RETORT SETTERS.
GEORGE NUTTALL & CO., 32, Havelock Road, Saltley, Birmingham.
Regenerator or other Furnaces erected to Engineers' own Designs. Best Work Guaranteed. Please write for Estimates.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.
Before placing Orders, please write for Estimate.
Telegraphic Address: "SATURATORS, BOLTON."

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER, LINCOLN."
[For Illustrated Advertisement, See April 3, p. 898.

CANNEL, COAL, ETC.
JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application
No. 80, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.
NEWTON GRANGE, NEWBATTLE, DALKEITH, }

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM; and 45 & 47, Westminster Bridge Road, LONDON, S.E.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
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SULPHURIC ACID.
JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

TO GAS AND WATER OFFICIALS.
HIGH-CLASS Cycles at reasonable and low Prices. Guaranteed for Twelve Months. Sent on approval. For Cash or Gradual Payment System. Send for Catalogue, Post Free.
MELROSE CYCLE COMPANY, COVENTRY.

SULPHURIC ACID for Sale.
BROTHERTON AND Co., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

WANTED, by steady Man (aged 33), a Situation as FOREMAN in Gas-Works. Total Abstainer. Thoroughly experienced in Regenerative, Generative, and other Settings, and the general routine of Gas-Works. Highest Reference from present Employer.
Address, No. 3477, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Situation by a smart, active Man (aged 37), Abstainer and Non-smoker, and just from the Colonies. Capable of taking charge of Small Gas Plant, acting as general help to Manager, or occupying position as Storekeeper in Large Gas or Engineering Works. Used to Fitting, Meter Fixing, Service Laying, Drilling, Tapping, and Screwing, Index Reading, Collecting, &c. Thirteen Years' Character.
Address No. 3480, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, good Retort Setters immediately.
Apply to JONAS DRAKE & SON, Gas Engineers, Ovenden, HALIFAX.

WANTED, a Working Foreman at the Gas-Works, Newport, Salop. House and Garden, Gas, and Coals Free. Married Man preferred.
Apply, stating Wages required and References, to Mr. HEANE, Secretary.

WANTED, two good Retort Setters, used to Generator and Regenerator Settings. Must understand Plans well. High Wages paid to good and steady Workers.
Apply, by letter, to No. 3482, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, for a Gas Company in the South of England, a WORKING FOREMAN. Must be a good Carbonizer, and used to the general routine of Gas-Works.
Apply, by letter, to No. 3476, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a steady, reliable, married Man, about 30 years of age, as STOKER, accustomed to Shovel Charging and attending to Engine and Exhauster. Wages 30s. per week and overtime. Constant employment to a suitable Man.
Apply, with Testimonials, to the MANAGER, Gas-Works, Bognor, SUSSEX.

WANTED, a thoroughly competent Man as WORKING FOREMAN for Gas-Works making 45 millions. Must be a good Mainlayer, able to take charge of Machinery, and do all Repairs.
Applications, with *copies* of Testimonials, stating Age, Experience, and Wages required, to No. 3479, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C. A Residence is provided on the Works, with Rates, Gas, and Water free.

CLEETHORPES GAS COMPANY.
ACCOUNTANT required by above Company to take charge of General Office. Salary £130 per year, rising £10 annually to £150 per year. Only those thoroughly experienced in the detail work of a Gas Company's Office, and having a knowledge of Secretarial Duties need apply.
Applications, with *copies* of Testimonials, to be sent to the undersigned.
E. J. BROCKWAY,
Engineer and Secretary.

WANTED, an Assistant for a Gas-Works making about 43 millions per annum. Will be required to assist in the keeping of Accounts, advise Consumers as to Fittings, and generally assist the Manager in all Departments. One with a knowledge of Drawing preferred.
Applications to be sent with Testimonials, not later than Saturday, the 28th inst., to No. 3478, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C., stating Age and when the Candidate is prepared to take up his duties if appointed. Salary £70 per annum.

GAS PURIFICATION.
OXIDE OF IRON BOG ORE.
BALE & CO.'S Oxide of uniform quality.
SPECIAL FIRE CEMENT, OXIDE PAINTS, OILS, SULPHURIC ACID, &c.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

SADLER & CO., Ltd., Middlesbrough, Tar Distillers and Tar Colour Manufacturers. BENZOL specially prepared for Gas Enrichment free from Sulphur. Pure Hydrated OXIDE OF IRON for Purifying Gas either for Sale or Lent on Hire. Always Buyers of GAS TAR and AMMONIACAL LIQUOR.

WANTED, at once, a steady active Man as METER INSPECTOR and COLLECTOR, who must be competent to read Meters correctly, write a good hand, and be correct at Figures. Salary to commence 25s. per week.
Application, accompanied by recent Testimonials, to be made to the MANAGER, Gas-Works, Bexhill, SUSSEX.

DERBY GASLIGHT AND COKE COMPANY.
WANTED by the Directors of this Company an experienced and competent ENGINEER AND MANAGER to take entire charge of their Works (make about 550 million cubic feet). He must have a practical knowledge of the Manufacture of Coal and Water Gas and Sulphate of Ammonia upon the best modern systems. The person appointed to devote the whole of his time to the duties, and be able to design and carry out Alterations and Extensions of Plant.
Applications to be by letter, marked "Engineer," stating Age, Salary required, Training and Experience, accompanied by *copies* of three Testimonials of recent date, addressed to the CHAIRMAN, at the Company's Office, Friar Gate, DERBY, on or before May 8, 1900.

THE Urban District Council of New Mills invite APPLICATIONS for the position of GAS MANAGER and SURVEYOR. The person appointed must be competent to undertake, and have a thorough knowledge of, the duties appertaining to both Offices, and devote all his time to the duties of the two Offices.
Applications, in Candidates' own handwriting, stating present and previous Employment, Age, Salary required, and whether in a position to commence duties at once, accompanied by not more than three recent Testimonials, to be sent to me the undersigned not later than Five o'clock, on Thursday, the 26th inst.
JOSEPH POLLITT,
Clerk to the Council.
Town Hall, New Mills,
April 12, 1900.

WANTED, Two Second-Hand Purifiers, 12 feet square or equal area.
Send Particulars and Price, and say where Purifiers can be seen, to No. 3481, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

NEW PREPAYMENT GAS LEDGER.
A SIMPLE but Perfect Record of the Slot Meter for One Year on One Page.
For a Sample Sheet, please enclose Twelve Stamps to Mr. S. DAWES, Homedale, CLEVEDON.

FOR SALE—Two Lancashire Boilers, each 6 ft. diameter by 20 ft. long, with Mountings. Been in use only a short time. Made by the Yorkshire Engine Company, Limited, Sheffield.
Apply to NEWTON, CHAMBERS, & Co., LIMITED, Thorncliffe Iron-Works, near SHEFFIELD, where the Boilers may be seen.

EXHAUSTERS, 1500 to 60,000 feet per hour, with or without Engines.
LIVESEY WASHERS, CUTLER CONDENSER, SCRUBBERS, 5 feet and 6 feet diameter, METERS, GOVERNORS, PURIFIERS (Sets of 6 feet and 10 feet square), BOILER and other TANKS, VALVES, &c.,
J. FIRTH BLAKELEY & Co., Thornhill, DEWSBURY.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

SHANKLIN GAS COMPANY, LIMITED.
GAS PLANT FOR SALE.
OWING to the adoption of Regenerator Settings, the Shanklin Gas Company, Limited, have now FOR DISPOSAL the following, in first-class condition:—
Three Sections of HYDRAULIC MAINS, two for Beds of six Retorts, and one for Bed of five Retorts; 17 OVAL MOUTHPIECES, 21 in. by 16 in., with all Cross-Bars, Lugs, &c., complete; all the necessary ASCENSION-PIPES, BENDS, and BRIDGE-PIPES, 6-inch SEAL-VALVES, 8-inch CAST-IRON FOUL MAIN and TAR-MAIN, with TEES, &c., to suit.
Also seven new 21 inch by 16 in. by 9 ft. 6 in. OVAL RETORTS.
The whole may now be seen disconnected upon application to the undersigned, who will furnish any further Particulars.
FRANK C. TAYLOR,
Engineer and Secretary.
Office of the Company,
Languard Road, Shanklin, I.W

SPENT OXIDE on Sale, and Fresh Oxide required, at the Dukinfield Gas-Works.
Apply to the MANAGER.

CONDENSER (Morris & Cutler's), 21 ft. 6 in. by 6 ft. 6 in. by 3 ft. 6 in., 1 million per day. Equal to new. Exceptional Bargain, if sold promptly.
Address No. 3463, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE — A Washer by Cockey. Size 10 ft. by 4 ft. 9 in. by 3 ft. 9 in., in four Compartments, with Manholes, Water-Supply Pipes, and 6-inch Gas-Connections. All in good condition. Suitable for a Gas-Works making 12 millions a Year and under.
For Particulars, apply to the MANAGER, Gas-Works, Whittington, near CHESTERFIELD.

ASHFORD URBAN DISTRICT COUNCIL.

TENDERS FOR GAS COAL.

THE Gas Committee are prepared to receive TENDERS for the supply of 5500 Tons of good GAS COAL.
Forms of Tender and Information may be obtained, on application (in writing only), from J. Morton, Manager, Gas-Works.
Tenders, endorsed "Coal," to be delivered on or before Five p.m., on Friday, April 27, 1900, at my Office, 11, Bank Street, Ashford, Kent.

JOHN CREERY,
April 20, 1900. Clerk.

COUNTY BOROUGH OF OLDHAM.

THE Oldham Corporation Gas-Works Committee are prepared to receive TENDERS for the supply of about 146,000 Tons of COAL and CANNEL required by them during the Year ending the 31st of May, 1901.
Specifications and Forms of Tender can be obtained on application to Mr. Arthur Andrew, Gas and Water Offices, Oldham, to whom Tenders are to be sent on or before Tuesday, the 8th of May.

A. NICHOLSON,
Town Clerk.
Oldham,
April 12, 1900.

GLOUCESTER GASLIGHT COMPANY.

GASHOLDER TANK.

THE Directors of the above Company invite TENDERS for the construction of a BRICK GASHOLDER TANK (about 156 feet in diameter and about 41 feet deep) at their Works, Hempsted.
Plans may be seen, and Specifications obtained, on application to the Company's Engineer, Mr. W. S. Morland, Gas-Works, Hempsted, near Gloucester, and on payment of £1 1s, which will be returned on the receipt of a *bonâ-fide* Tender.
Sealed Tenders, endorsed "Tender for Gasholder Tank," to be sent to the undersigned at the Gas Offices, Eastgate Street, Gloucester, not later than Tuesday, the 1st day of May, 1900.
The Directors do not bind themselves to accept the lowest or any Tender.

WILLIAM E. VINSON,
Secretary.
Gas Offices, Gloucester,
April 5, 1900.

BOROUGH OF SMETHWICK GAS-WORKS.

TENDERS FOR NEW PURIFIERS.

THE Gas Committee invite Tenders —
1. For Building a BRICK PIT, 88 ft. 6 in. by 62 ft. 2 in. and the PIERS to carry four Purifiers.
2. For a Set of four PURIFIERS, 36 ft. by 24 ft., and Covers, with Valves, Connecting Mains, and Lifting Gear.

Copies of Specifications and Drawings may be obtained on application to Mr. B. W. Smith, at the Gas-Works, at a charge of £1 1s., which will be returned upon receipt of a *bonâ-fide* Tender.
Contractors will be required to pay the Standard Rate of Wages recognized in the District.
Tenders, endorsed "Contract No. 1" or "Contract No. 2," and addressed to the Chairman of the Gas Committee, to be delivered to the undersigned on or before the 3rd of May next.
The Committee do not bind themselves to accept the lowest or any Tender.

By order,
(Signed) W. J. STURGES,
Secretary.
Gas Offices, Town Hall,
Smethwick, April 9, 1900.

HOYLAKE AND WEST KIRBY GAS AND WATER COMPANY, LIMITED.

TENDERS FOR GAS COAL AND CANNEL.

THE Directors of the above-named Company are prepared to receive TENDERS for the supply of GAS COAL and CANNEL as follows:—

3000 Tons	more or less	SCREENED GAS COAL.
3000 Tons	without	UNSCREENED GAS COAL.
900 Tons	restriction	CANNEL.

Price to include delivery on rails on Gas-Works Siding, Hoylake. Deliveries to extend as required from the 1st of July next to the 30th of June, 1901.
The Directors reserve to themselves the right to accept Tenders for the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any Tender.
Sealed Tenders, marked "Tender for Coal," must be delivered to the undersigned not later than Ten a.m. on Wednesday, the 2nd of May next.
No Canvassing.
Printed forms of Tender will be forwarded by post upon application in writing.

By order,
A. G. READDY,
Secretary.
8, Filey Terrace, Hoylake,
April 18, 1900.

DRIFFIELD URBAN DISTRICT COUNCIL.

THE Gas Committee of the above Council are prepared to receive TENDERS for the RENEWAL of THREE SETTINGS of RETORTS and the CONSTRUCTION of GENERATOR FURNACES for the same.
Particulars may be obtained of Mr. Henry Tobey, Engineer, Malton.
Tenders must be delivered to the undersigned on or before the 1st day of May next.

GEO. B. TONGE,
Clerk to the Council.
Driffield, April 17, 1900.

RAMSBOTTOM GAS COMPANY.

TENDERS FOR COAL.

THE Directors of this Company invite TENDERS for the supply of 6000 Tons of GAS COAL, to be delivered at their Siding, Stubbins, near Ramsbottom, as may be required during the Year ending June 30, 1901.
Further Particulars and Form of Tender on application to the undersigned.
Tenders to be sent to John Rothwell, Esq., Chairman, Gas-Works, Ramsbottom, and endorsed "Tender for Coal," not later than Saturday, May 5.

FRANK BARRETT,
Manager and Secretary.

BOROUGH OF NELSON.

THE Gas Committee invite Tenders for the supply of CONDENSERS for their Gas-Works.
Form of Tender, with Particulars, can be had on application to Mr. A. Allan, Gas Engineer, Gas-Works, Nelson.
Sealed Tenders, endorsed "Condensers," to be sent to me the undersigned, not later than the 4th of May, 1900.
The lowest or any Tender will not necessarily be accepted.

R. M. PRESCOTT,
Town Clerk.
Town Hall, Nelson,
April 18, 1900.

TENDERS FOR GAS COAL.

THE Corporation of Droitwich invite TENDERS for the supply of from 1200 to 1700 Tons of best screened GAS COAL, to be delivered free at Droitwich (G.W.) Station, at such times and in such quantities as may be required prior to the 31st of May, 1901.
Particulars and Form of Tender may be obtained on application to the Manager of the Gas-Works.
Sealed Tenders, on the form provided for the purpose (with Analysis of the Coal to be supplied), endorsed "Tender for Gas Coal," to be sent to the undersigned, on or before the 11th of May.
The Corporation do not bind themselves to accept the lowest or any Tender.

S. JOHN TOMBS,
Town Clerk.
Droitwich, April 12, 1900.

TO COAL MERCHANTS.

THE Milton-next-Sittingbourne Urban District Council invite TENDERS for a supply of GAS COALS, for the year ending March 31, 1901. The quantity required will be about 1400 Tons; and the deliveries must be in such quantities and at such times as the Gas Manager shall direct.
All necessary Information, with Specification and Form of Tender, can be obtained on application to Mr. A. Davison, Gas Office, Milton-next-Sittingbourne.
Sealed Tenders (which must be on the form supplied) should be addressed to the Chairman, Milton-next-Sittingbourne Urban District Council, and endorsed "Tender for Coal," and must be sent or delivered to me before Four o'clock p.m. on Tuesday, May 1, 1900.
The right of rejection of any Tender is reserved.

WM. PARHAM,
Clerk to the Council.
Town Hall, Milton-next-Sittingbourne,
Kent, April 19, 1900.

DEVONPORT GAS AND COKE COMPANY.

TENDERS FOR GAS COALS.

THE Directors of the Devonport Gas and Coke Company invite TENDERS for the supply of 20,000 Tons or 10,000 Tons (at their option), of unscreened (through and through) NEWCASTLE, DURHAM, or SILKSTONE GAS COALS, to be shipped in such quantities, and at such times, as may be required, between the 1st of June, 1900, and the 31st of May, 1901.
The Cargoes to be discharged at the Tamar Wharf, Devonport.
Tenders may be quoted either c.i.f. or f.o.b. or f.o.r. at Devonport (but c.i.f. preferred), endorsed "Tender for Coals," and addressed to the Chairman, Devonport Gas and Coke Company, Devonport.
Tenders to be sent in on or before Monday, the 30th of April next.
Devonport, April 18, 1900.

TENDERS FOR GAS COAL.

THE Directors of the Watford Gas and Coke Company invite TENDERS for the supply, during the Twelve Months from the 1st day of July, 1900, to the 30th day of June, 1901, of 11,500 Tons (more or less), of GAS COAL (screened or unscreened), to be delivered at the Bushey Station of the London and North-Western Railway.
Forms of Tender and Information may be obtained on application (in writing only) of me the undersigned.
Tenders to be delivered on or before the 7th day of May, 1900, addressed to the Chairman of the Watford Gas and Coke Company, Watford, and endorsed "Tenders for Gas Coal."
Tenders must be on the form supplied, any alteration of which will invalidate the Tender.
The Directors do not bind themselves to accept any Tender.

J. DUNCAN ROYAL,
Secretary.
Watford Gas and Coke Company's Offices,
Watford, April 18, 1900.

GAS TAR.

THE Aberystwyth Gas Company invite TENDERS for the purchase of the surplus TAR produced at their Works for a period of Twelve Months, commencing the 1st of May, 1900.
Tenders to be sent in not later than the 28th of April, 1900.

R. T. JONES,
Secretary.

WINCHESTER WATER AND GAS COMPANY.

TENDERS FOR GAS COAL.

THE Directors ask for Tenders for delivery of 6000-8000 Tons over Twelve Months from the 1st of July next.
Full Particulars and Price to be sent on or before Friday, the 27th inst., to the undersigned.
Lowest Tender not necessarily accepted.

FREDK. G. DEXTER,
Engineer and Manager.
Offices: Staple Gardens,
Winchester.

HAWORTH URBAN DISTRICT COUNCIL.

THE above Council are prepared to receive TENDERS for the supply of 3000 Tons of GAS COAL (screened or unscreened), delivered at the Station of the Midland Railway Company, Haworth, during the ensuing Twelve Months.
Tenders to be sent to me the undersigned not later than Thursday, the 26th inst.

WM. ROBERTSHAW,
Clerk.
Burlington Chambers, North Street,
Keighley.

BARNOLDSWICK URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

THE Council are prepared to receive TENDERS for the supply of 2200 Tons of best screened GAS COAL, to be delivered at Barnoldswick Station (Midland Railway) by the 31st of May, 1901.
Further Particulars may be obtained from the undersigned.
Tenders to be sent in not later than May 2, 1900, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Coal."

D. E. GARLICK,
Manager.

SHIPLEY GASLIGHT COMPANY.

TENDERS are invited for the supply of the whole or part of 18,000 Tons of best screened GAS COAL or NUTS, to be delivered free at Shipley Station (Mid. or G.N.) or into the Company's Coal-Stores per Leeds and Liverpool Canal during the Twelve Months ending June 30, 1901.
Tenders to be sent to the undersigned not later than Saturday, May 5, 1900, endorsed "Tender for Coal."
The Directors do not bind themselves to accept the lowest or any Tender.

T. G. WILCOCK,
Secretary and Manager.
Gas-Works, Shipley.

BOROUGH OF CLITHEROE.

(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Gas Committee invite Tenders for the supply of 4000 Tons of screened GAS COAL, to be delivered during the Year ending May 31, 1901.
Further Particulars and Form of Tender may be obtained from the undersigned.
Sealed Tenders, endorsed "Tender for Gas Coal," addressed to the Chairman of the Gas Committee, to be delivered at my Office on or before Tuesday, the 1st of May, 1900.

ROBT. BARRETT.
Gas-Works, Clitheroe,
April 11, 1900.

PETERBOROUGH GAS COMPANY.

GAS COAL.

THE Directors of the above Company invite TENDERS for 4000 Tons of best screened GAS COAL or COBBLES, to be delivered in equal weekly quantities to Aug. 31, 1900.
Tenders, endorsed "Coal," and addressed to the Chairman of the Company, to be delivered not later than Twelve o'clock at noon, on Tuesday, the 8th day of May, 1900.
The Directors do not bind themselves to accept the lowest or any Tender, and reserve to themselves the power to accept a portion of a Tender.

JOHN BARTON,
Secretary and Manager.
Gas-Works, Peterborough,
April 20, 1900.

ALTRINCHAM GAS COMPANY.

COAL AND CANNEL CONTRACTS.

TENDERS are invited for best screened GAS COAL and CANNEL for One Year from the 1st of July next.
Estimated Quantities required: Coal 11,000 Tons; Cannel, 4000 Tons.
Deliveries to be free at Altrincham Railway Station, and as required.
Sealed Tenders, endorsed "Tender for Coal" or "Cannel," stating the description of each, the pits from which they are to be raised, the amount proposed to be supplied, and cash terms for monthly payments, to be sent, addressed to the undersigned so as to be received not later than Twelve o'clock noon, on Tuesday, the 8th day of May next.
The Directors do not bind themselves to accept the lowest or any Tender; but the person or persons whose Tender may be accepted will be required to execute an agreement for the sure performance thereof.
No Special Form of Tender is required or supplied.

F. R. B. LINDSELL,
Secretary.
Gas Offices: Moss Lane,
Altrincham, April 20, 1900.

[For continuation of Contract Advertisements, see p. 1084.

The Latest in Incandescent Street Lighting.

SIMMANCE & ABADY'S PATENT SYSTEMS.

ABOLISHING CONSTANTLY

BURNING FLASH-LIGHTS.

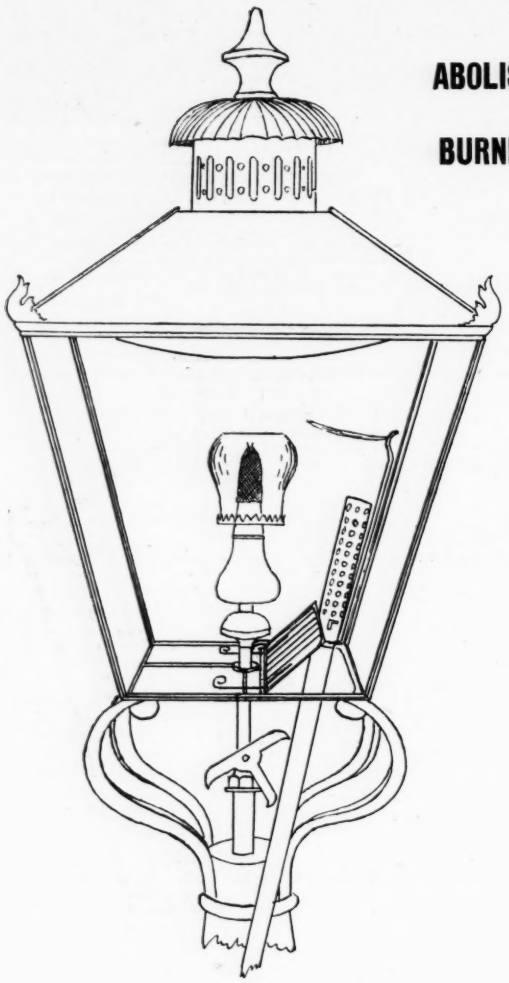


Fig. 1.
Turn Main Cock half on and light Jet.

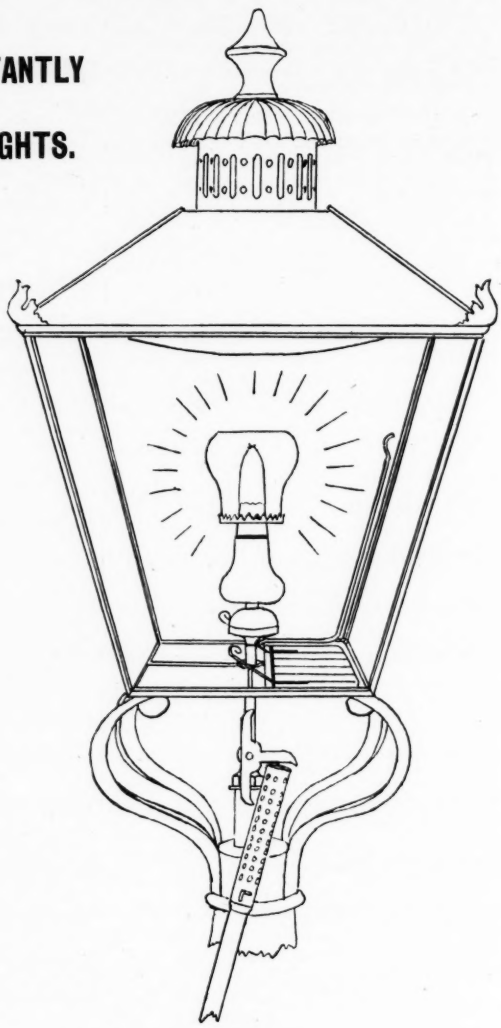


Fig. 2.
Withdraw Torch and Turn Cock fully on.

THIS IS THE PATENT COCK WITH

MOMENTARILY LIGHTED BYE-PASS

REFERRED TO BY Mr. SHELDRAKE, in his Paper Read before the Eastern Counties Gas Managers' Association at Cambridge last week (see p. 1054).

It has been specified by the **PLYMOUTH CORPORATION** for use in about 2000 Lanterns.

SPECIAL NOTE.

No special, expensive Lantern is required, the Lighting Flap being arranged with a Stop to absolutely prevent the Torch coming in contact with Burner, Mantle, or Globe.

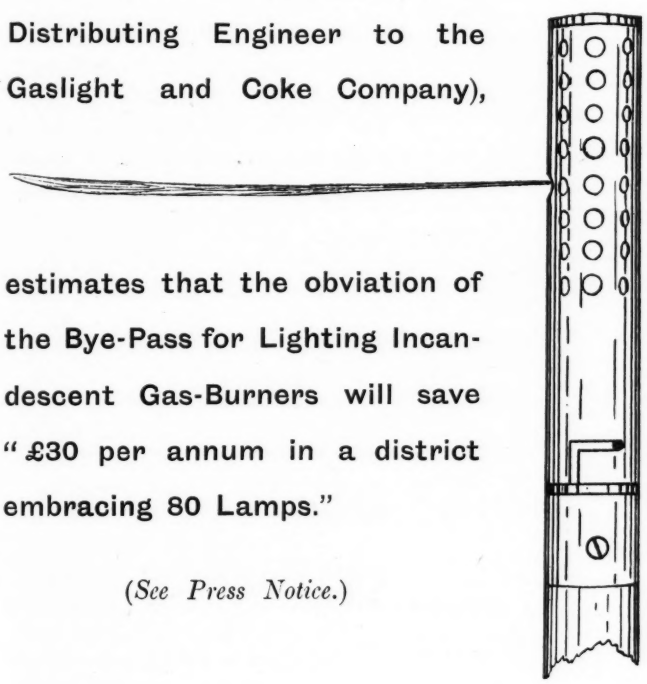
ALEXANDER WRIGHT & CO., LIMITED,

SOLE OWNERS OF PATENT.

The Latest in Incandescent Street Lighting.

Simmance and Abady's Patent System effects a large Capital and Annual Saving. A Lantern with Bottom Lighting Flap, an Ordinary Lever Cock, and a Non-Bye Pass Incandescent Burner (with or without Chimney), are used; and **SIMMANCE & ABADY'S PATENT TORCH** will light the Burner **without any possibility of injuring Mantle.** The Illustrations show Head of Torch and method of use.

Mr. G. F. L. FOULGER (Chief Distributing Engineer to the Gaslight and Coke Company),



estimates that the obviation of the Bye-Pass for Lighting Incandescent Gas-Burners will save "£30 per annum in a district embracing 80 Lamps."

(See Press Notice.)

Fig. 3.

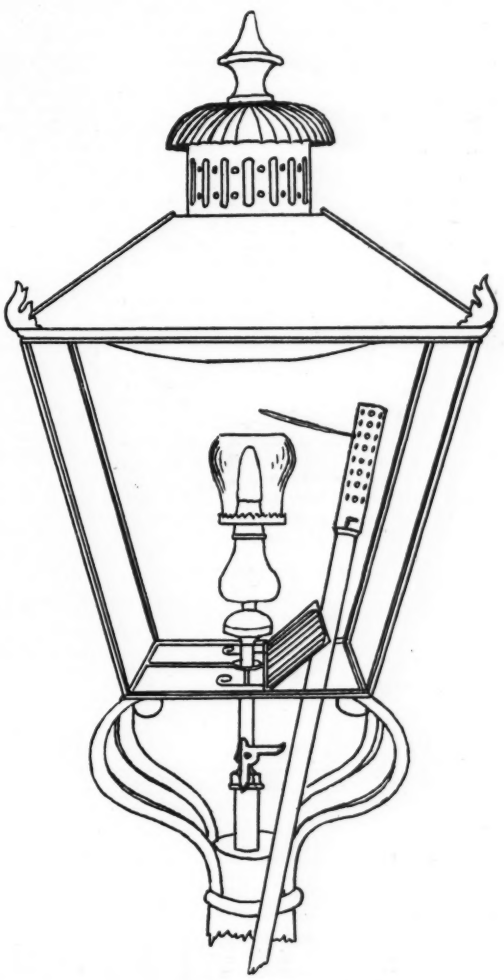


Fig. 4.
Turn on Lamp Cock and Light Burner.

The Lamplighter has the power of projecting a jet of Flame over the Burner by a slight Pressure of the Thumb on the Torch Handle. There is no Fierce Blow-Pipe effect.

A GUARD IS FIXED TO KEEP THE TORCH AWAY FROM BURNER.

For further Particulars, see Booklet sent you a few days ago, or apply to Owners of Patent—

ALEXANDER WRIGHT & CO., LIMITED,

PRECISION WORKS, 81, PAGE STREET, WESTMINSTER, S.W.

LONG EATON GAS COMPANY, LIMITED.

TENDERS are invited for the supply of the whole or part of One Year's requirement of best screened GAS COAL, to be delivered free at the Company's Sidings, Long Eaton (Midland Railway).

Tenders, endorsed, to be in by the 4th prox.

The Directors do not bind themselves to accept any Tender.

Form of Tender and further Particulars may be had from Mr. G. STEVENSON, Gas-Works, LONG EATON.

TENDERS FOR COAL.

THE Directors of the Harlow and Sawbridgeworth Gaslight and Coke Company invite TENDERS for the supply of 1200 Tons of good GAS COAL, delivered at Harlow Station (free) in quantities of 100 Tons monthly.

Tenders, addressed to the undersigned, to be sent in on or before Tuesday, May 1, and to be sealed and endorsed "Tender for Coal."

E. F. PARKER,
Secretary.

Gas Company, Harlow.

TENDERS FOR COAL.

THE Directors of the Maidstone Gas Company invite TENDERS for the supply of 28,500 Tons of unscreened DURHAM GAS COAL for the Year ending June 30, 1901.

Particulars and Form of Tender can be obtained on application to the undersigned at the Gas-Works.

Tenders sealed, and endorsed "Tender for Gas Coal," to be sent in not later than Wednesday, the 2nd day of May, 1900, addressed to the Chairman of the Gas Company, Maidstone.

The Directors do not bind themselves to accept the lowest or any Tender.

HENRY SMYTHE,
General Manager.

MELTON MOWBRAY GAS COMPANY.

THE Directors of the above Company invite TENDERS for the supply of 1000 to 3000 Tons of GAS COAL, NUTS, and CANNEL, to be delivered at the M.R. and G.N. Stations here as required, during the Year ending April 30, 1901.

Further Particulars may be obtained from the Manager, Mr. G. Duncan; and Tenders to be sent on or before the 8th of May next.

The Directors do not bind themselves to accept the lowest or any Tender.

By order,
GEO. ROSE,
Secretary.

Melton Mowbray,
April 21, 1900.

BOROUGH OF WARRINGTON.
(GAS DEPARTMENT.)

THE Gas Committee of the above Borough are prepared to receive TENDERS for the following—viz.,

(1) Supplying and Erecting Six SETTINGS OF RETORTS.
(2) RETORTS, FIRE-BRICKS, and CLAY.
(3) 1000 to 8000 Tons of CANNEL.
(4) 50,000 Gallons (or part) of BENZOL for Gas Enrichment.

Further Particulars can be obtained on application to Mr. W. S. Haddock, Engineer to the Works.

Sealed Tenders, endorsed "Tender for Retorts," &c., as the case may be, addressed to the Chairman, Gas-Works, Warrington, must be sent in not later than the 27th inst.

FREDK. TAYLOR,
Secretary.

Gas Offices, Warrington,
April 10, 1900.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

SAWSTON GAS-WORKS, CAMBRIDGESHIRE.

About equi-distant from Whittlesford and Shelford Stations on the Main Cambridge Line of the Great Eastern Railway. The Works are conveniently situate, and comprise Retort-House (with six Retorts), Coal-Shed, Purifier-House, Gasholder, Meter-House, Governor-House, Workshop, Large Yard, and Manager's House, together with the Mains; the whole to be sold as a going concern, and with possession on completion. Held for a term of about 70 years unexpired, at the nominal Rent of £1 per annum.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on Tuesday, May 8, at Two o'clock precisely.

Particulars of G. J. F. MUSKETT, Esq., Solicitor, 12, DOWGATE HILL, E.C., and of Mr. ALFRED RICHARDS, Auctioneer, 18, FINSBURY CIRCUS, E.C.

Price 6s., Cloth Bound,

THE CHEMISTRY OF ILLUMINATING GAS.

By N. H. HUMPHRYS, Assoc.M.Inst.C.E., F.C.S.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

ISSUE OF SIX PER CENT. PREFERENCE SHARES.

BOURNEMOUTH GAS AND WATER COMPANY.

Sale by Tender of 1000 Six per cent. Preference Shares, in pursuance of the provisions of the Bournemouth Gas and Water Act, 1896.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company TO SELL BY TENDER 1000 PREFERENCE SHARES of £10 each (the Dividend on which is limited to £6 per cent.), to be paid up in full on or before the 31st of May, 1900.

Particulars and Conditions of Tender may be obtained at the Company's Offices, Bournemouth, or of the Secretary as under.

Sealed Tenders must be sent to the Secretary not later than Eleven o'clock on Friday Morning, the 27th of April, 1900.

By order,
WILLIAM CASH,
Secretary.

London: 90, Cannon Street, E.C.

ST. ANNES-ON-THE-SEA GAS COMPANY.

MESSRS. WILLIAM WILSON & SON have received Instructions from the Directors to SELL BY AUCTION, at the Room of the Manchester Society of Chartered Accountants, 65, King Street, Manchester, on Tuesday, May 8, 1900, at 3.30 o'clock in the afternoon prompt, subject to Conditions to be then produced, NEW ORDINARY SHARES sufficient to produce, with the Premiums thereon, the sum of £10,000, being part of the amount of £45,000 of Additional Capital authorized by the St. Annes-on-the-Sea Gas Act, 1898, and ranking for Dividend out of the Profits of the Company after the rate of Five per cent. per annum.

Particulars and Conditions of Sale may be had from Messrs. Woodcock and Sons, Solicitors, Haslingden; the Auctioneers, 29, Fountain Street, Manchester; and from the Secretary to the Company.

By order,
WILLIAM H. NUTTER,
Secretary.

Gas Offices, St. Annes-on-the-Sea,
April 24, 1900.

HENLEY-ON-THAMES GAS COMPANY.

NOTICE OF IMPORTANT SALE OF GAS STOCK.

MR. J. CHAMBERS is favoured with Instructions from the Directors of the Henley Gas Company to SELL BY AUCTION, at the Catherine Wheel Hotel, Henley-on-Thames, on Thursday, May 3, 1900, at Four o'clock in the afternoon to the minute, in convenient Lots, £1200 of

NEW ORDINARY STOCK

in the Henley Gas Company, to bear a Dividend not to exceed 7 per cent. per annum, except as provided by the Henley Gas Act, 1888.

Full Dividends have been paid on all the Stocks of the Company for several Years; and this Stock is sold subject to the Special Act of Parliament giving the Company full Statutory Powers.

The Auctioneer desires to call the attention of large and small Capitalists to this Sale, which affords a safe and sound Investment.

Particulars and Conditions of Sale may be obtained at the place of Sale, and of the AUCTIONEER, 15, Hart Street, HENLEY-ON-THAMES.

NITRATE of Thorium and Cerium. FABRIK CHEMISCHER PRAEPARATE VON STHAMER, NOACK, AND CO., HAMBURG.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.

For Particulars Price, &c., apply to Mr. EDWARD PRICE, 119, Queen's Road, FINSBURY PARK, N.

Prices are Reduced.

THORNLEY GAS COALS
WORKED BY THE
WEARDALE IRON & COAL Co., Ld.
OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by Messrs. J. & H. S. PATTINSON.

Yield of Gas per Ton . .	10,500 Cub. Ft.
Illuminating Power . . .	16·9 Candles.
Coke (of good quality) . .	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c., apply to the
WEARDALE IRON & COAL Co., Ld.
QUAYSIDE, NEWCASTLE-ON-TYNE.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER." Telephone 1806.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH N.B.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD
BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

JAMES OAKES & CO.

ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

HARDMAN & HOLDEN, Ld.

ESTABLISHED 1820.

SULPHURIC ACID.

GUARANTEED absolutely free from Arsenic and of excellent Purity. Specially prepared for Sulphate of Ammonia Manufacturers.

Works: BLACKBURN; Miles Platting and Clayton, MANCHESTER.

Head Office: Miles Platting, MANCHESTER.

Inquiries Solicited.

THOMAS TURTON AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

LONDON OFFICE:
90, CANNON STREET, E.C.

LONDONDERRY GAS COALS

FROM THE

LONDONDERRY COLLIERIES,

COUNTY OF DURHAM.

Available Output up to 5000 Tons per day.
Yield of Gas 11,000 cubic feet per Ton of Coal as per Analysis by
Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,
SEAHAM HARBOUR,
COUNTY OF DURHAM.

BOLDON GAS COALS.

ANALYSIS.

Yield of Gas per Ton. .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

For Prices, &c., apply to
W. H. PARKINSON,
THE HARTON COAL CO., LTD.,
NEWCASTLE-ON-TYNE.

Telegraphic Address: "PARKINSON, NEWCASTLE."

HOLMSIDE
GAS COALS.

Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton . . . 11,205 Cubic Feet.
Illuminating Power $16\frac{7}{10}$ Stand. Sperm. Candl.
Coke (of good & pure quality) $13\frac{3}{4}$ Cwt. per Ton.
Sulphur . . . . . A little over 1 per Cent.
Ash . . . . . Under 1 per Cent.
Tar . . . . . 163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor 103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR
PELTON GAS COALS.

Present Daily Produce available 3000 Tons.

Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.

Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,
HOLMSIDE & SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

GAS PLANT New or 2nd Hand Equipments for Coal Gas, Water Gas, Oil, Acetylene, Coke Oven, and Blast Furnace Gas.

POWER or LIGHT WORKS.

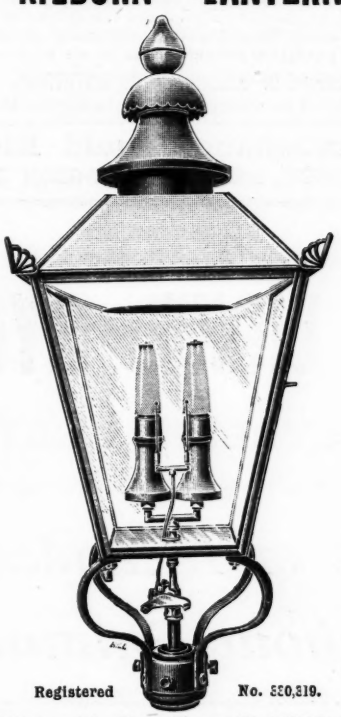
Also **VALUATION** Consultation, Inspection, & Expert Reports.

JAS. WRIGHT, M.I.M.E. BRIDGE HOUSE, BLACKFRIARS, E.C.

WELDON MUD
FOR
GAS PURIFICATION,
For use in the
RECOVERY OF SULPHUR,
ALSO
Removal of last Traces of SULPHURETTED HYDROGEN in catch position.

Full Particulars on application to the Patentees:
GAS DESULPHURIZATION CO.,
— *LIMITED,* —
1, FENCHURCH AVENUE, LONDON, E.C.

THE
"KILBURN" LANTERN.



Registered No. 330,319.

Fitted with Steel Enamelled White Reflector.

H. GREENE & SONS, LTD.
19, FARRINGDON ROAD, E.C.

Telephone: 1215 HOLBORN. Telegrams: "LUMINOSITY."

HOT WATER INSTANTLY.
NIGHT OR DAY.
Hot Bath when wanted.
Boiling Water in a Minute.
EWART'S
'LIGHTNING' GEYSER
For Gas or Oil.
346, EUSTON ROAD, LONDON.
Illustrated Price List Free.

HEATHCOTE GAS COAL.

Rich in Illuminating Power and Yield of Gas.

Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.,
CHESTERFIELD.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE
BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE, SON, & HUNTER,
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
E. FOSTER & CO.,
21, JOHN STREET, ADELPHI, LONDON, W.C.

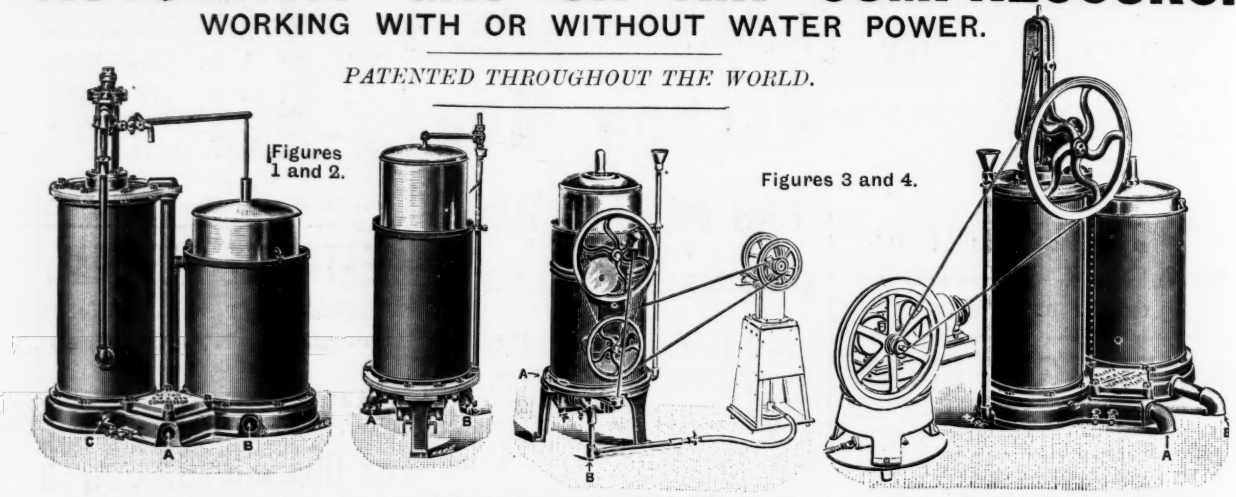
JAMES MILNE & SON, LTD.,
GAS ENGINEERS
MILTON HOUSE WORKS EDINBURGH.
LONDON. — LEEDS. — GLASGOW.

KEITH'S PATENT

AUTOMATIC GAS OR AIR COMPRESSORS.

WORKING WITH OR WITHOUT WATER POWER.

PATENTED THROUGHOUT THE WORLD.



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"Simplicitas Maxima Virtus."

ADOPTED BY

The Welsbach Incandescent Gas-Light Company, Limited; The Intensified Gas-Light Company, Limited; The New Sunlight Incandescent Company, Limited; The Yorkshire Intensified Gas Lighting Syndicate; Societe Anonyme d'Eclairage et de Chauffage Intensifs (Somzee-Greyson System), Brussels; and by others, for their Systems of HIGH-PRESSURE OR INTENSIFIED GAS LIGHTING.

This INVENTION, as Illustrated: Is, as shown by Figs. 1 and 2, worked by the ordinary service; uses an infinitesimal amount of water; requires no attention nor Lubrication; and, as shown by Figs. 3 and 4, may also be worked without water power and solely by the use of gas or oil, giving equally efficient results. In both cases, the Apparatus is absolutely automatic in action; is silent in operation; is devoid of friction in the compressing portion; gives a steady unvarying pressure of gas or air without pulsation on either the inlet or the outlet side; and is the most perfect of its kind in existence. **BEWARE OF UNSCRUPULOUS IMITATIONS.**

Plants of any magnitude designed for automatically increasing Gas Pressure in Low-Lying Districts.

The Water Motor and Automatic Liquid Elevator Company, Limited,
27, FARRINGDON AVENUE, and 59, FARRINGDON STREET, LONDON, E.C.

THE

DENAYROUZE LIGHT SYNDICATE, LTD.

28, VICTORIA STREET, WESTMINSTER, S.W.

The Pioneers of Incandescent Burners without Chimneys.

THE "SMALL TORCH" Burner (Bandsept Patent) for Street Lighting, consuming **3½** feet of Gas per Hour, having an efficiency of **25-Candle Power per Cubic Foot of Gas** consumed at ordinary pressure, is not only the **BEST** but **CHEAPEST** intensive **CHIMNEYLESS** Burner on the Market.

PRICE COMPLETE WITH MANTLE

4s. 9d.

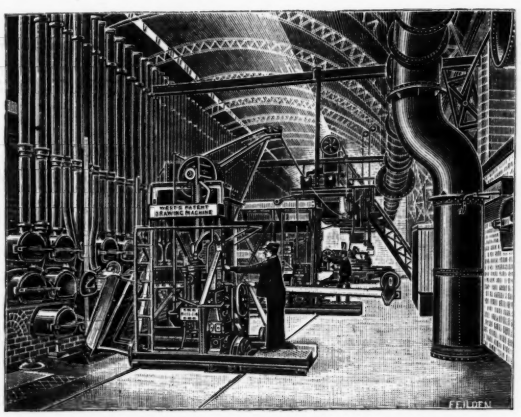
All other Burners supplied by the Syndicate proportionately reduced, full Particulars of which will shortly be issued to the Trade, and followed by new and complete Catalogue.

WEST'S GAS IMPROVEMENT CO., LTD.,

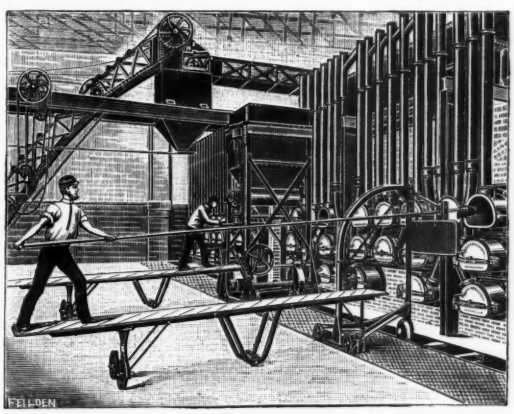
ALBION IRON-WORKS, MILES PLATTING,

And 104, QUEEN VICTORIA STREET, LONDON, E.C.

MANCHESTER.



West's Compressed Air Charging and Drawing Machinery for Gas-Retorts.

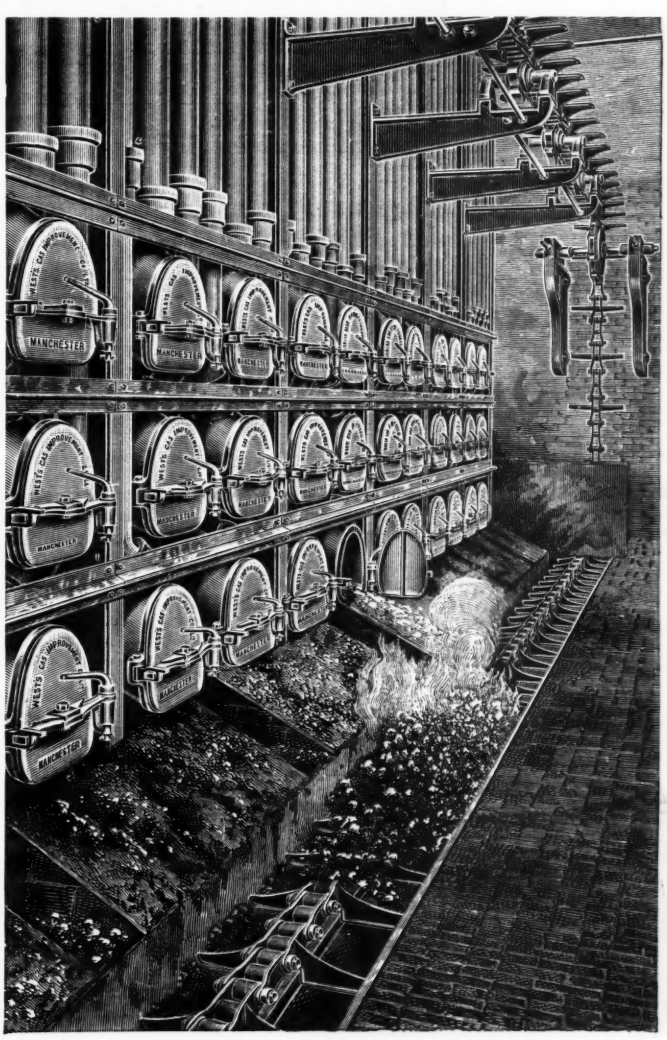


West's Manual Charging and Drawing Machinery for Gas-Retorts.

WEST'S

PATENT

Silent Coke-Conveyor.



SPECIAL FEATURES:

This Conveyor is specially adapted for Elevating and Storing Coke in the Coke Yard or Overhead Hoppers.

SILENT IN ACTION, and is easily driven; the power required for driving being very small.

Has easily renewable and inexpensive wearing parts.

Is fitted with HUNT'S PATENT ROLLER CHAIN, which is specially adapted for the conveying of gritty materials, as the Rollers prevent excessive wear of the Chain Wheels.

The working parts of the Chain and Slide-Bar are easily and efficiently lubricated by a special lubricator fixed at one point.

No Rivets or Bolts in the Chain to work loose; the whole of the Chain being kept together by the Joint Pins.

DOES NOT MAKE ANY BREEZE, as the Coke does not roll over in its passage along the Conveyor; and no violent rubbing of the pieces against one another occurs.

CONTRACTORS FOR

West's Patent Regenerator Furnaces and Settings, Mouthpieces, Retort-Bench Fittings, &c. Air-Compressors, Hauling-Capstans, and General Engineering.

THE WIGAN COAL & IRON CO., LIMTD.,

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Works; BLACK BULL STREET, LEEDS.

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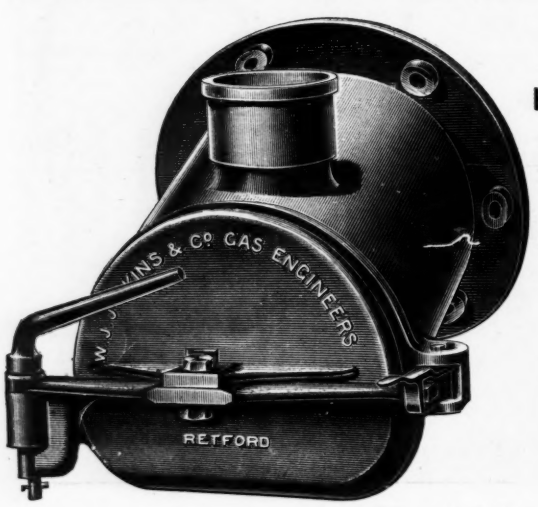
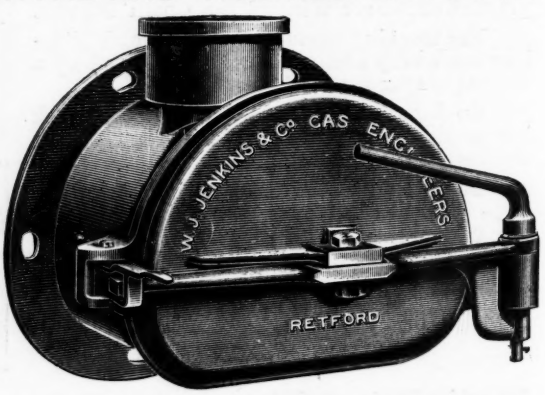
MOUTHPIECES

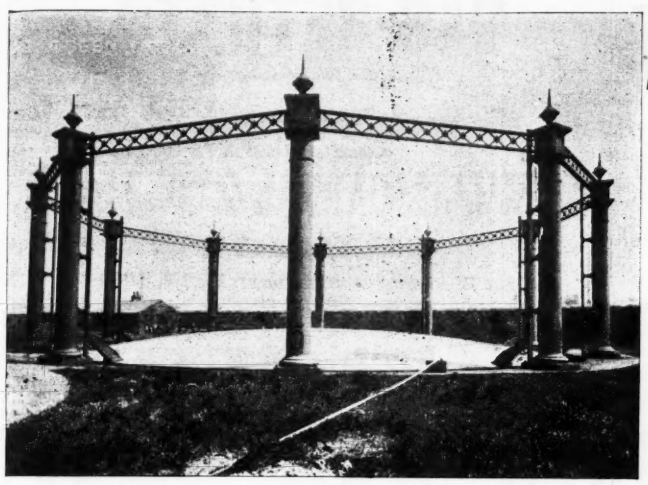
WITH SELF-SEALING LIDS FOR HORIZONTAL AND INCLINED RETORTS.





W. J. JENKINS & CO., LTD., RETFORD.

GASHOLDERS



A GASHOLDER

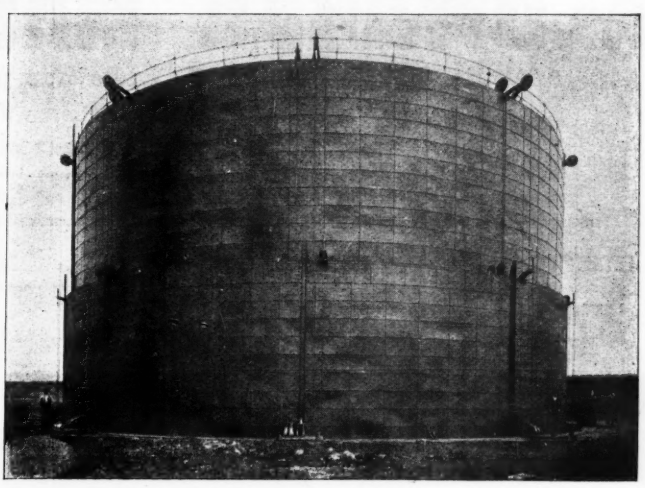
Guided by Ten massive Cast-Iron Columns and Girders is shown in the accompanying Photo.

AS IT WAS

originally erected by us

IN 1883.

We last year took down the Guide-Framing, converted the Holder into a Two-Lift; and this Photo. ☛ shows it



AS IT IS NOW

entirely guided by our Patent Steel Cable System.

In many other instances, Columns have been sold and replaced by our Cables.

We are prepared to alter any Holders in a similar manner to the above. Engineers who have trouble with the irregular working of Column-Guided Holders, will find the Cable System vastly superior and quite reliable.

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FLANGE PIPES FOR STEAM.

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ARROL-FOULIS

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FOR

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[See Illustrated Advertisement, April 3, p. 848.]

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Value in Pounds of Sperm, 820·80.

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THE SIX MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS;

The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.

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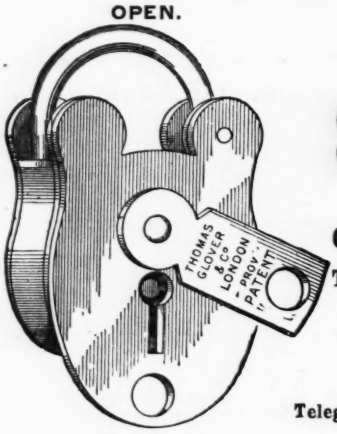

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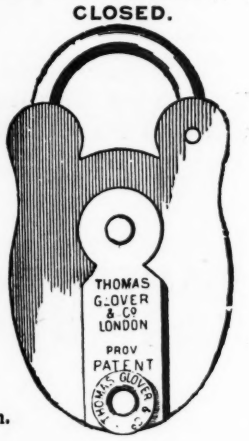

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BIRMINGHAM: 1, OOZELLS STREET. *Telegraphic Address: "GOTHIC."*

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Manufacturers of Glasshouse Pots and Crucibles of every kind.
Established 1836.

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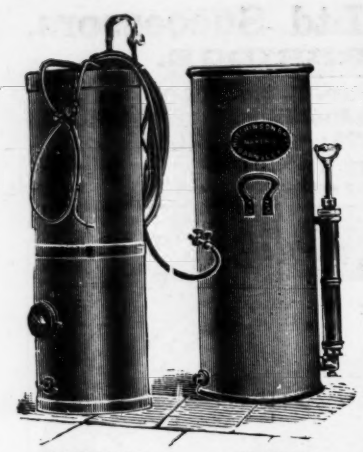

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HUTCHINSON BROS. & CO., LTD.

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BEST QUALITY OF MATERIAL AND WORKMANSHIP.

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HYDROMETERS, TEST-JARS (GLASS OR LEAD), COPPER SCOOPS, &c., &c.

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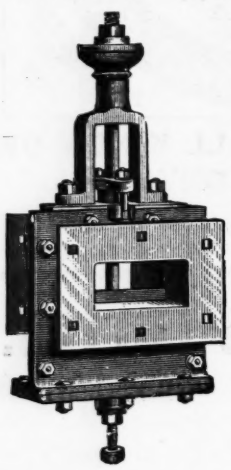

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